HELENSBURGH WASTE DISPOSAL DEPOT ANNUAL REPORT 2025

WASTE SERVICES JULY 2025

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Contents

1 Background

Wollongong City Council (WCC) maintains the former Helensburgh Landfill (the site), which is located at Nixon Place, Helensburgh NSW. The site ceased operation in 2012 and no longer receives waste with site activities limited to maintenance, upkeep and environmental monitoring. The site is legally identified as Lots 621 and 915 DP 752033 with the site boundary illustrated in **Figure 1**.

WCC holds Environmental Protection Licence (EPL) 5861 issued by the NSW Environment Protection Authority (EPA) under the *Protection of the Environment Operations Act 1997* (POEO Act). The licence authorises the scheduled activity of waste disposal (application to land) at the site with no limit on the scale of activity.

A *Landfill Environmental Management Plan* (LEMP) was prepared in 2008 (GHD 2008) on behalf of WCC to ensure that environmental compliance is maintained throughout the site and following closure. The management measures provided in the LEMP were developed in consideration of the *NSW Environmental Guidelines: Solid Waste Landfills* (EPA 1996) and also addressed the monitoring and reporting requirements of EPL 5861. The *NSW Environmental Guidelines: Solid Waste Landfills* (EPA 1996) were superseded in 2016 and replaced with the *NSW Environmental Guidelines: Solid Waste Landfills*, *Second Edition (*EPA 2016).

The site is in a maintenance and closure phase and, as such, a revised LEMP is not considered necessary in response to the updated *Environment Guidelines* (EPA 2016). However, in December 2021 an updated Operational and Maintenance Plan was completed.

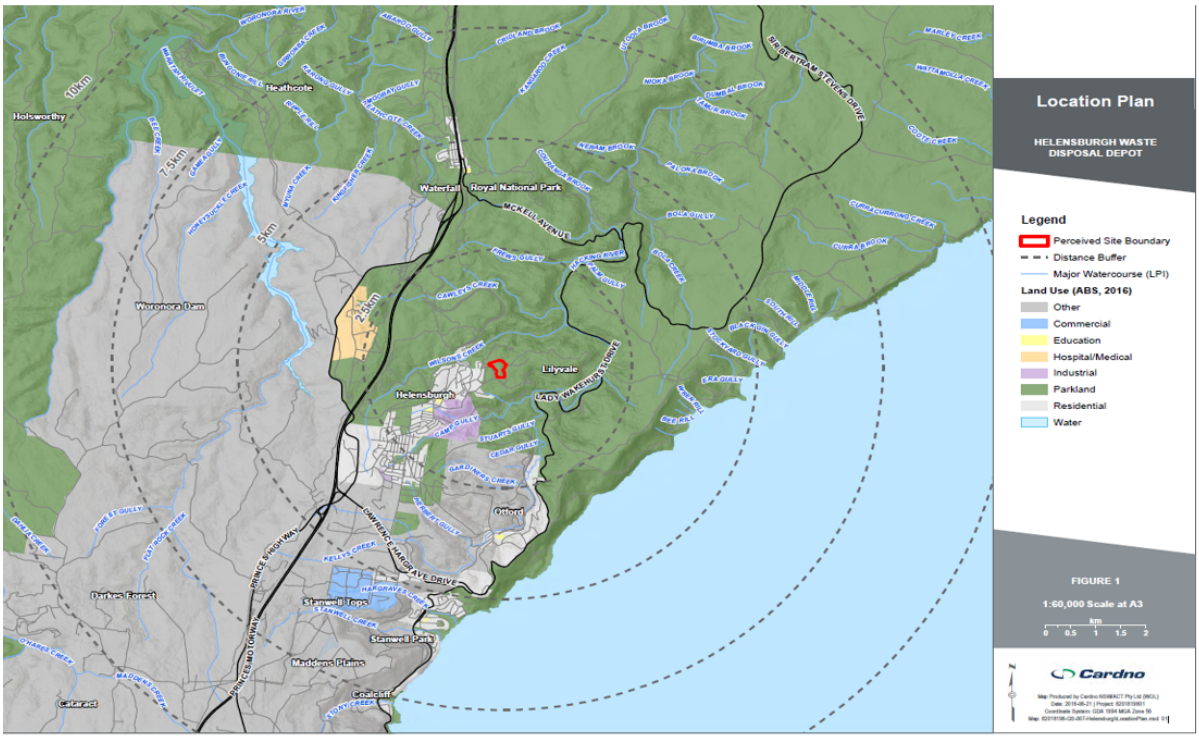


Figure 1: Helensburgh Location Plan

1.1 Objectives

The objectives of this Annual Report are to provide the EPA with the following:

- A summary of pollution monitoring data gathered during the reporting period of the 29th May 2024 to the 28th May 2025.
- Interpretation of monitoring data to assess the environmental performance of the site for compliance with conditions of the EPL.

1.2 Scope

1.2.1 Fieldwork

To meet the objectives of the Annual Report, the following scope of works was undertaken during the reporting period in accordance with the requirement of the EPL:

- Surface gas monitoring at areas where intermediate or final cover has been placed;
- Subsurface gas monitoring of the seven gas monitoring wells;
- Collection of surface water samples at the three surface water monitoring points;
- Collection of groundwater samples from eight existing groundwater monitoring wells; and
- Monitoring of trade wastewater at one sampling point located at the pre-treatment discharge.

1.2.2 Reporting

Section 6 (R1) of EPL 5861 states that an Annual Return and an Annual Report must be prepared by the license holder.

In accordance with Section 6 (R1.8) of the EPL, this Annual Report provides an assessment of environmental performance relevant to the license conditions including:

- Tabulated results of all monitoring data required to be collected by this licence;
- A graphical presentation of data from at least the last three years to show variability and/or trends;
- An analysis and interpretation of all monitoring data;
- An analysis of, and response to, any complaints received.
- Identification of any deficiencies in environmental performance identified by the monitoring data, trends or incidents, and of remedial action taken, or proposed to be taken to address the deficiencies; and
- Recommendations on improving the environmental performance of the facility.

This report has been prepared in accordance with the reporting conditions provided in Section 6 of the EPL and in consideration of the *NSW Environmental Guidelines: Solid Waste Landfill, Second Edition* (EPA 2016) *Requirements for publishing pollution monitoring data* (EPA 2013).

2 Site History

The LEMP (GHD) provides the following information in relation to the historical site use:

- *Prior to establishment of waste disposal operations, the site was vacant bushland.*
- *In the years the site operated as a 'trench and fill' operation, with a significant amount of waste burned within the trenches.*
- *It is understood that from the 1960's until approximately the early 1990's, the site operated as a sanitary depot accepting mainly nightsoil and putrescible wastes. Limited environmental controls were in place at this time. The site continued to accept these types of wastes until 1991, when putrescible waste ceased to be accepted at the site.*
- *Since 1991, the site has only been permitted by Wollongong City Council to accept 'Class 2' style wastes e.g. furniture, wood, paper, plastics, etc.*
- *Following the completion of the 'trench and fill' operations, landfilling operations shifted to 'land raise' operations which involved the construction of a small hill created from the deposited waste materials. Filling operations constituted 'land raising', which overtip previously landfilled waste in the site's central southern area.*
- *Material used for daily covering of the waste was obtained from clean fill materials delivered to the site.*

2.1 Topography and Drainage

The site is situated on the upper slopes of a hill on the northern eastern most outskirts of the suburb of Helensburgh. The gradient of the site slopes towards the north and east in the direction of the adjoining Garrawarra State Conservation Area. The final form of the landfill is mounded with a slight to moderate radial grade in all directions toward the site boundary.

An elevation profile was created utilising an aerial image taken in December 2024 from Nearmap which shows that the lowest elevations of the site are located in the eastern portion with an approximate relative level (RL) of 190 m Australian Height Datum (AHD). The highest elevations are located at the centre of the site at the location of the former waste deposition area with an approximate RL of 210 m AHD.

Approximate surface contours are shown on **Figure 2.**

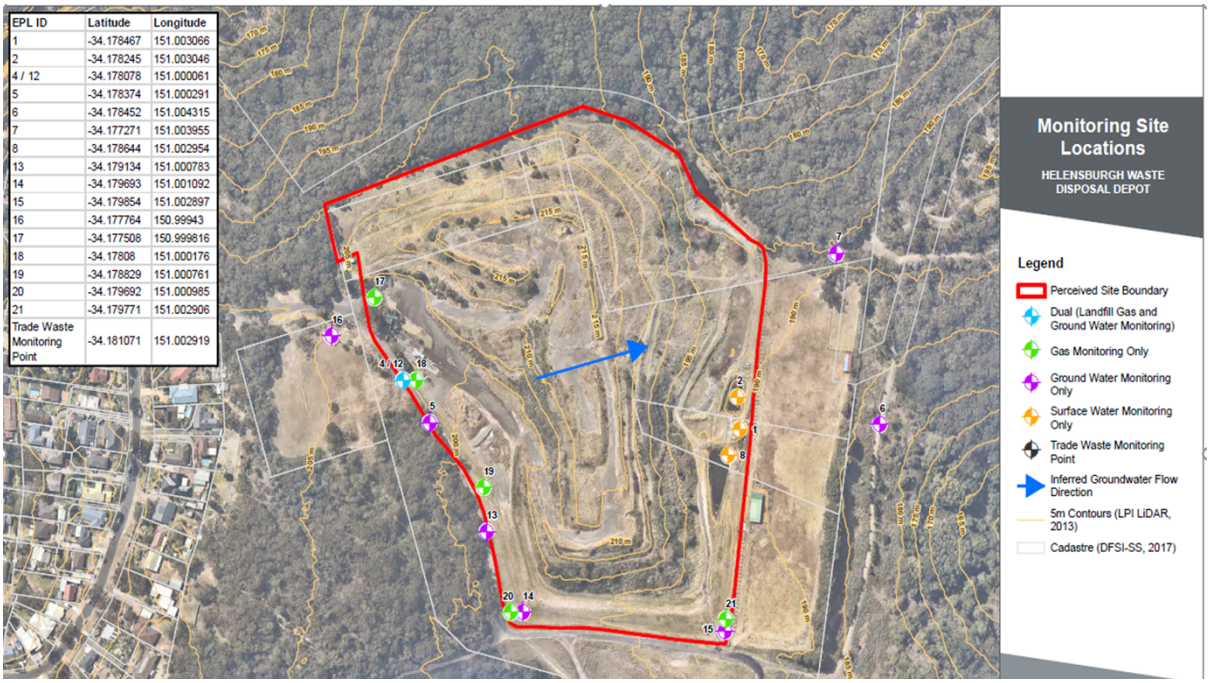


Figure 2: Monitoring Site Locations

2.2 Soil and Geology

The site is situated within the Sydney Basin and sits atop the Illawarra Escarpment. The natural geology beneath the site is part of the Cumberland Sub-Group of the Illawarra Coal Measures, which are Permian in age. A review of the 1:100,000 geological map 'Wollongong-Port Hacking' (Department of Mineral Resources, 1985) situates the site on Hawkesbury Sandstone, which is characterised by medium to coarse grained quartz sandstone with very minor shale and laminate lenses, which is generally consistent with soil observations noted during a previous intrusive investigation completed by GHD in 2008.

Test pitting completed by GHD (2008) as part of the LEMP suggests that the near surface natural geology of the area is as follows:

- Orange brown clayey sand overlying;
- Orange mottled clayey sand overlying;
- White clay sand with red mottled laterite (ironstone) with clay sand overlying;
- White loosely cemented sandstone (assumed to be regional bedrock).

GHD noted that the thickness of residual soil was between 2.5m and 4m before bedrock was encountered. According to Council, areas of the Site that were historically used for deposition of waste have been capped with virgin excavated natural material (VENM), a material type as defined by the NSW EPA, with a nominal thickness of 0.3m, however, earthworks at the Site since closure showed a capping thickness up to 3.0m.

2.3 Hydrogeology

2.3.1 Groundwater

Groundwater monitoring data has been collected from the Site since September 1996. Historical gauging of groundwater levels indicates that the local aquifer typically ranges from 1.5 to 4.5 metres below ground level (mbgl). Groundwater is inferred to flow from the west to north easterly direction towards the Hacking River

A groundwater bore search included in the LEMP (GHD 2008) indicates the presence of five registered groundwater wells within a 5 km radius of the Site. The registered uses of these bores are for domestic stock purposes.

2.3.2 Surface Waters

The LEMP (GHD 2008) identified a spring beneath the Site, which is understood to feed surface water to a stream east of the site that discharges to the Hacking River, located approximately 400 metres to the southeast.

All surface water runoff from the landfill is collected by a water collection system around the perimeter of the Site that drains to three stormwater ponds located along the eastern boundary of the Site.

2.4 Climate

Climate data for the Site was obtained from the nearby Bellambi Bureau of Meteorology (BOM) Weather Station (ID 068228). The weather station is located approximately 20 km south of the Site at the base of the escarpment. This data is considered to be a reliable representation of the Site conditions during the reporting period.

Table 1-1 summarises the key climatic data from the Bellambi weather station.

Table 1-1 Climatic Data – Bellambi Weather Station

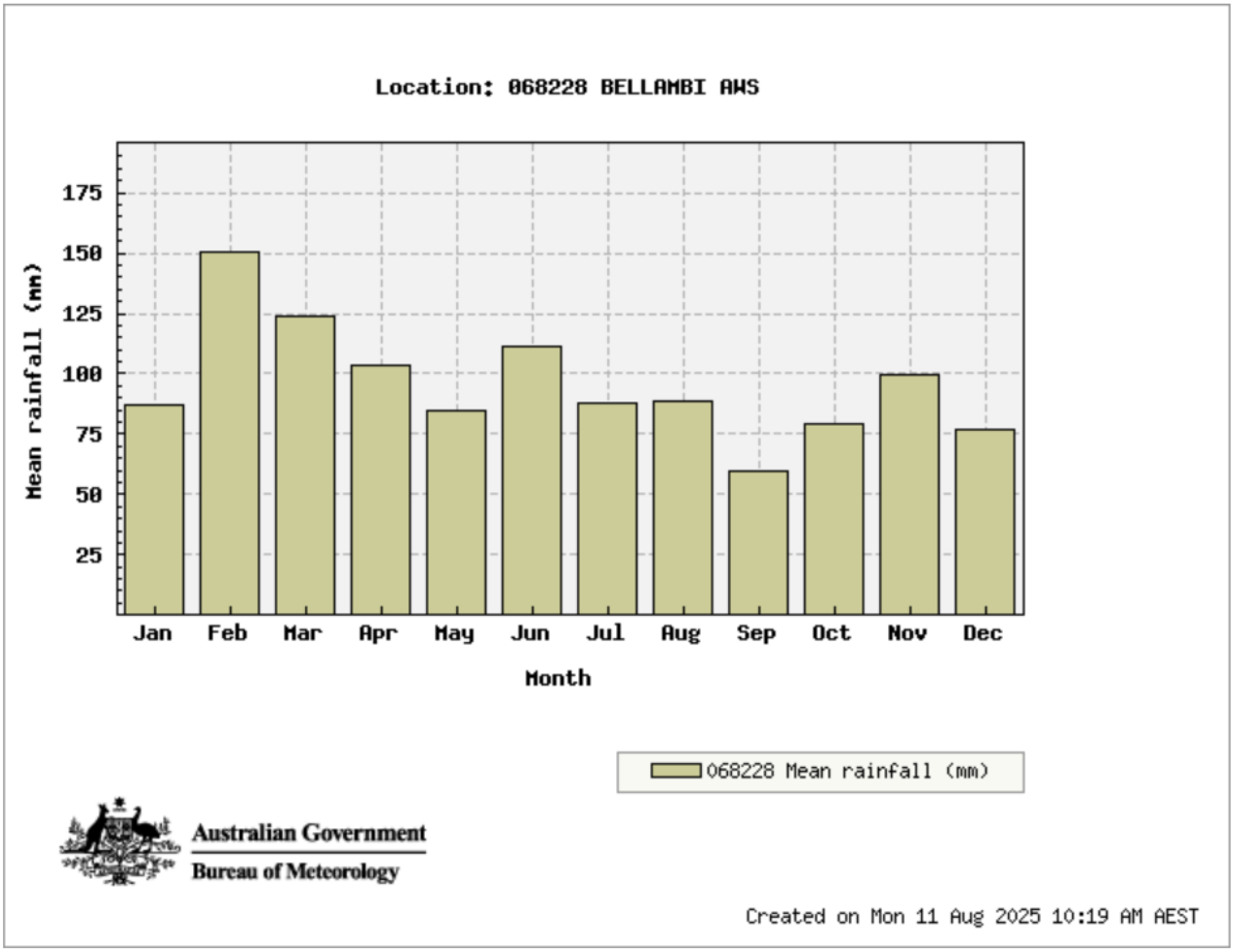
	2024							2025				
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Rainfall (mm)$_1$	190.2	53.8	13.8	44.6	51.8	134	16.2	122.4	47.4	176	90.4	185
Mean max temperature (°C)$_1$	17.2	17	20.1	21.7	21.3	23.4	26.4	24.9	25.5	24.9	23.9	20.6
Mean min temperature (°C)$_1$	11	10.7	12.5	12.6	14	17.3	18.6	19.2	19.6	19.4	17.1	14.3
Mean 9am wind speed (km/h) $_2$	17	15	39	21	19	17	18	21	17	20	16	18
Mean 3pm wind speed (km/h)$_2$	17	18	26	49	27	19	20	29	24	23	25	22
Mean 9am relative humidity (%)$_2$	61	61	63	51	63	74	65	77	74	80	67	71
Mean 3pm relative humidity (%)$_2$	63	56	60	49	63	77	67	74	72	75	66	66

The averages from the previous reporting period for the Bellambi weather station are shown in **Table 1-2** and Graph 1 have been included for comparative purposes.

Table 1-2 Averages from Previous Reporting Period – Bellambi Weather Station

	2023							2024				
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Rainfall (mm)$_1$	7.6	10.2	123	69.2	30.2	123	201	58.2	126.2	63.2	251	216
Mean max temperature (°C)$_1$	18.4	19.2	18.7	22.1	22.9	21.6	25.6	25.9	25.7	24.9	22.1	19.2
Mean min temperature (°C)$_1$	11.6	11.2	13.5	13.0	14.4	10.4	20.4	20.2	19.8	18.6	15.6	13.2
Mean 9am wind speed (km/h) $_2$	43	13	16	19	19	17	15	16	16	11	16	1
Mean 3pm wind speed (km/h)$_2$	37	19	20	25	25	26	19	21	22	20	21	19
Mean 9am relative humidity (%)$_2$	56	59	54	70	61	61	75	76	76	75	69	70
Mean 3pm relative humidity (%)$_2$	60	53	58	67	58	61	73	76	74	72	69	71

Graph 1. Longterm Monthly Rainfall Averages – Bellambi Weather Station



This reporting period recorded 1125.6 mm of rainfall, which was less than the previous year. The lowest rainfall month was August 2024 with only 13.8 mm, whilst the highest was June 2024 with 190.2 mm. It is significant to note that rainfall was received every month of the reporting period.

Temperatures were mild with minimal fluctuations due to more stable weather patterns. The lowest average temperature was 10.4 degrees Celsius and the highest was 25.9 degrees Celsius. Wind speed and humidity were also mild throughout this reporting period.

3 Field Investigations

3.1 Fieldwork Methodology

The subsections below describe the frequency of monitoring, the monitoring methods, monitoring locations and analytes for surface gas, subsurface gas, stormwater, leachate and groundwater. The fieldwork methodologies implemented during the reporting period were developed in consideration of the guidance provided in the *NSW EPA Environmental Guidelines: Solid waste landfills (second edition*) (EPA 2016).

3.1.1 Surface Gas

Surface gas monitoring was completed during the reporting period to assess for potential surface emissions of landfill gases (LFG) emanating from the landfilled areas at the Site. The purpose of surface gas monitoring is to demonstrate that the cover material effectively controls the emission of landfill gas. The fieldwork methodology for surface gas monitoring is summarised below in **Table 1-3**. The location of each surface gas monitoring location is shown on **Figure 3**.

Figure 3: Surface Gas Monitoring Locations

Table 1-3 Surface Gas Monitoring Methodology

Activity	Description
Frequency and Dates of Monitoring	Surface gas monitoring for methane was completed annually during the reporting period in accordance with Section 5 (M2.2) of EPL 5861.
Monitoring Method	Methane was measured by a third-party contractor, ALS Environmental, using an Inspectra Laser Gas Detector. The instrument used to measure methane concentrations was calibrated prior to each monitoring event. Surface gas monitoring was achieved by testing the atmosphere 5 centimetres above the ground surface in areas with intermediate or final cover where wastes have been placed. The monitoring was completed on calm days (winds below 10km/hr) and in transects with an approximate spacings of 25m.

Activity	Description
Monitoring Locations	Surface gas monitoring for methane was undertaken at the following locations: ▪ Point 3: areas where intermediate or final cover has been placed i.e. transects A, B, C, E, F, G, H, I, J, K, L, M, N, O and P ▪ Weighbridge Office ▪ Nixon Place and Halls Road fence lines: transect Q

3.1.2 Subsurface Gas

Subsurface gas monitoring was completed during the reporting period to assess for potential offsite migration. The fieldwork methodology for subsurface gas monitoring is summarised below in **Table 1-4**. The location of each subsurface gas monitoring location is shown on **Figure 2**.

Table 1-4 Subsurface Gas Monitoring Methodology

Activity	Description
Frequency of Monitoring	Subsurface gas monitoring for methane was completed quarterly during the reporting period in accordance with Section 5 (M2.2) of EPL 5861.
Monitoring Method	Subsurface gas monitoring was measured by a third party contractor, ALS Environmental, using an Inspectra Laser Gas Detector. The instrument used to measure methane concentrations was calibrated prior to each monitoring event. Subsurface gas monitoring was achieved by testing the methane concentration in six landfill gas monitoring wells (listed below) that are situated around the northern, eastern and southern perimeters of the landfill. The contents of each well was sampled and analysed prior to potential dilution by air.
Monitoring Locations	Subsurface gas monitoring for methane was undertaken at landfill gas monitoring wells, Point 4, Point 17, Point 18, Point 19, Point 20 and Point 21.

3.1.3 Stormwater

Stormwater monitoring was scheduled to be completed during the reporting period to detect excess sediment loads in stormwater leaving the site and/or cross-contamination of stormwater with landfill leachate.

The fieldwork methodology for stormwater monitoring is summarised below in **Table 1-5**. The location of stormwater monitoring locations is shown on **Figure 2**.

Table 1-5 Stormwater Monitoring Methodology

Activity	Description
Frequency of Monitoring	Stormwater sampling was scheduled to be completed daily during any discharge in accordance with Section 5 (M2.3) of EPL 5861, however, stormwater monitoring was not undertaken during the reporting since overflows of the stormwater pond did not occur.
Monitoring Method	N/A
Monitoring Locations	Had an overflow from the stormwater pond occurred a water sample would have been collected from the following monitoring point in accordance with Section 5 (M2.3) of EPL 5861: ▪ 1 (overflow from stormwater pond)
Analytes	In accordance with Section 5 (M2.3) of EPL 5861 each stormwater sample would have been scheduled to be analysed for: ▪ pH ▪ Total Suspended Solids (TSS)

3.1.4 Leachate

Leachate monitoring was completed periodically during the reporting period to provide data on the composition, height levels and volumes of leachate produced by the Site, and to record details about any irregular discharges or overflows of leachate from the Site. The fieldwork methodology for leachate monitoring is summarised below in **Table 1-6**. The location of leachate monitoring locations is shown on **Figure 2.**

Table-1-6 Leachate Monitoring Methodology

Activity	Description
Frequency of Monitoring	Leachate sampling was completed quarterly to assess electrical conductivity and annually to assess for the remainder of parameters / contaminants (listed below) in accordance with Section 5 (M2.3) of EPL 5861.
Monitoring Method	Leachate monitoring was completed by a third party contractor, ALS Environmental. Grab samples of water were collected using a scoop at the nominated sampling point (summarised below). The instrument used to measure water quality parameters was calibrated prior to each monitoring event.
Monitoring Locations	A leachate sample was collected from the Monitoring Point 2 (leachate pond) in accordance with Section 5 (M2.3) of EPL 5861.
Analytes	In accordance with Section 5 (M2.3) of EPL 5861 each leachate sample collected during the annual monitoring event was analysed for: ▪ Metals (aluminium, arsenic, barium, cadmium, chromium (hexavalent and total), cobalt (Point 5, 6 and 7 only), copper, lead, manganese, mercury, zinc) ▪ Benzene, toluene, ethylbenzene, xylene (BTEX) ▪ Fluoride ▪ Nitrate and nitrite ▪ OCP ▪ OPP ▪ PAH ▪ Alkalinity ▪ Calcium, magnesium, potassium, sodium, chloride, sulphate ▪ pH and conductivity ▪ Standing water level ▪ TDS ▪ TPH ▪ Total phenolics ▪ TOC ▪ Nitrogen (ammonia)

3.1.5 Surface Water

Surface water monitoring was completed periodically during the reporting period to verify that offsite surface water bodies were not being impacted by leachate or by sediment-laden stormwater from the landfill. The fieldwork methodology for surface water monitoring is summarised below in **Table 1-7**. The location of each stormwater monitoring location is shown on **Figure 2**.

Table 1-7 Surface Water Monitoring Methodology

Activity	Description
Frequency of Monitoring	Surface water sampling was completed quarterly in accordance with Section 5 (M2.3) of EPL 5861.
Monitoring Method	Surface water monitoring was completed by a third-party contractor, ALS Environmental. Grab samples of water were collected using a scoop at the nominated sampling point. The instrument used to measure parameters was calibrated prior to each monitoring event.
Monitoring Locations	A surface water sample was collected from Monitoring Point 8 (pony club) in accordance with Section 5 (M2.3) of EPL 5861.
Analytes	In accordance with Section 5 (M2.3) of EPL 5861 each sample was analyzed for: ▪ Conductivity ▪ Dissolved oxygen ▪ Faecal coliforms ▪ Nitrogen (ammonia) ▪ pH ▪ Potassium ▪ Redox potential ▪ Total dissolved solids ▪ Total organic carbon

3.1.6 Groundwater

Groundwater monitoring was completed periodically during the reporting period to track groundwater quality with time and evaluate interactions with leachate and potential contaminants. The fieldwork methodology for groundwater monitoring is summarised below in **Table 1-8**. The location of each groundwater monitoring location is shown on **Figure 2**.

Table 1.8 Groundwater Monitoring Methodology

Activity	Description
Frequency Monitoring	Groundwater monitoring was completed on a quarterly basis during the reporting period in accordance with Section 5 (2.3) of EPL 5861.
Monitoring Method	Groundwater was sampled by a third-party contractor, ALS Environmental, using bailer technique. A pre-calibrated water quality meter used to measure groundwater quality parameters during monitor well purging. The collected groundwater samples were submitted to ALS Environmental for analysis of contaminants and parameters of interest (summarised below). Ground water levels were recorded before purging.
Monitoring Locations	Groundwater bores monitored during the reporting period included Point 5, Point 6, Point 7, Point 12, Point 13, Point 14, Point 15 and Point 16.
Analytes	In accordance with Section 5 (M2.3) of EPL 5861 groundwater monitoring point analysis: <u>Annually</u> ▪ Metals (aluminium, arsenic, barium, cadmium, chromium (hexavalent and total), cobalt (Point 5, 6 and 7 only), copper, lead, manganese, mercury, zinc) ▪ Benzene, toluene, ethylbenzene, xylene (BTEX) ▪ Fluoride ▪ Nitrate and nitrite ▪ OCP ▪ OPP ▪ PAH ▪ TPH ▪ Total phenolics <u>Quarterly</u> ▪ Alkalinity ▪ Calcium, magnesium, potassium, sodium, chloride, sulphate ▪ pH and conductivity ▪ Standing water level ▪ TDS ▪ TOC ▪ Nitrogen (ammonia)

3.1.7 Trade Wastewater

Monitoring of trade wastewater was completed periodically during the reporting period to confirm that water quality parameters of wastewater discharge were within the acceptable criteria. Discharge of trade waste to sewer was undertaken by Council in accordance with the *Consent to Discharge Industrial Trade Wastewater* (Sydney Water 2023) (the *Consent*). The fieldwork methodology for trade wastewater monitoring is summarised below in **Table 1-9**. The trade waste monitoring location is shown on **Figure 2**.

Table 1-9 Trade Wastewater Monitoring Methodology

Activity	Description
Frequency	Trade wastewater sampling was undertaken in July 2019 and approximately every 2 months thereafter. If trade wastewater was not discharged on the scheduled day, then the sample was taken on the next day that trade wastewater was discharged. The reading of the flowmeter was obtained at the commencement and conclusion of each sampling event. Discrete samples were collected and tested for pH at the start and finish of each sample day.
Monitoring Method	Trade wastewater was sampled by a third-party contractor, ALS Environmental. Composite samples were collected over a 24-hour period using a Composite Auto-sampler, and pre and post monitoring samples were collected in the form of grab samples. The probe used to measure water quality parameters was calibrated prior to each monitoring event and the trade wastewater samples collected were submitted to ALS Environmental for analysis of parameters of interest (summarised below).
Monitoring Locations	In accordance with the *Consent* (Sydney Water, 2019) monitoring of trade wastewater was undertaken at a sampling point located at the pre-treatment discharge, excluding domestic sewage and prior to the point of connection to the Sewer. The specific monitoring location is shown on **Figure 2**.
Analytes	Composite samples were submitted to ALS Environmental for analysis of the following: ▪ Nitrogen (ammonia) ▪ Suspended solids; ▪ Total dissolved solids; and ▪ Iron. Discrete samples were tested on site for pH and temperature using a calibrated water quality meter. Additionally, the volume of wastewater discharged was obtained from the total flow reading presented on the flowmeter system.
Aesthetic Assessment	During sampling the sampler recorded the following aesthetic properties in accordance with the *Consent* (Sydney Water, 2023): ▪ Temperature; ▪ Colour; ▪ pH; ▪ Fibrous materials; ▪ Gross solids; and ▪ Flammability.

4 Performance Criteria

Environmental monitoring data gathered during the reporting period was screened against the applicable criteria for each sample type / matrix as summarised below.

4.1 Surface Gas

The results of surface gas monitoring were screened against the criteria provided in the *Environmental Guidelines* (EPA 2016). Specifically, the threshold level for closer investigation and potential action was detection of 500 parts per million of methane at any point of the landfill service.

4.2 Subsurface Gas

The results of subsurface gas monitoring were screened against the criteria provided in the *Environmental Guidelines* (EPA 2016). Specifically, the threshold levels for further investigation and corrective action were detection of methane at concentrations above 1% (v/v) and carbon dioxide at concentrations of 1.5% (v/v) above established natural background levels.

4.3 Stormwater

In accordance with Section 3 (L2.5) of EPL 5861, the performance criteria for stormwater was no discharge of contaminated stormwater (stormwater that exceeds the limits of pH and total suspended solids) under dry weather conditions or storm events that are less than a 5 day, 75th percentile. The license defines a 5 day, 75th percentile rainfall event as a rainfall depth of 35.6mm over any consecutive 5 day period.

4.4 Leachate

In accordance with Section 3 (L2.7) of EPL 5861 the limit for leachate was no discharge of leachate to waters under dry weather conditions or storm event(s) of less than 1:25 year, 24 hour recurrence interval. The license defines a 1:25 year, 24 hour duration rainfall event as a rainfall depth of 306 millimetres over any consecutive 24 hour period.

The performance criteria adopted for leachate discharges was based on records held by Council regarding the timing and nature of leachate discharges during the reporting period. Comparison was made to adopted surface and groundwater criteria below to provide and initial screening level.

4.5 Surface Water and Groundwater

The selected performance criteria for surface water and groundwater samples were based on the recommendations of the *Environmental Guidelines* (EPA 2016) and in consideration of the land use, site setting and the plausible interactions between potential contaminants and human and environmental receptors.

The Australian Water Quality Guidelines (2020) are used in water quality assessment this reporting period. These water quality guidelines provide detailed approaches and advice on identifying appropriate **guideline values** for selected indicators. These guideline values help to ensure that agreed community values and their management goals are protected. For the protection of aquatic ecosystems, locally derived guideline values are most appropriate.

Assessment of water physical characteristics was based on the Australian Water Quality Guidelines (South East Australia Lowland Physical Characteristics). This provides indicative threshold values for the suitability of site surface waters for discharge into nearby surface water systems.

4.6 Trade Wastewater

Trade wastewater analytical results were screened against the criteria provided in the *Consent* (Sydney Water, 2023). The *Consent* provides criteria for a variety of parameters for the long term average daily mass (LTADM) and the maximum daily mass (MDM).

In addition to analytical performance criteria the *Consent* provides limits for aesthetic properties of trade wastewater including temperature, colour, pH, fibrous materials, gross solids and flammability.

The *Consent* was renewed in October 2023.

4.7 Odour

In accordance with Section 8 (E1.3) of EPL 5861 offensive odour must not emit beyond the boundary of the premises. The performance criteria adopted for potential offensive odour emissions was occurrences (if any) of complaints from members of the public relating to odour and monthly staff monitoring.

5 Results

Monitoring results gathered during the reporting period are provided in the data tables in **Appendix A** and are summarised in the relevant subsections below. Laboratory certificates of analysis and quality reports have not been appended to this report due to the large number of files, however, they can be provided upon request.

5.1 Gas

5.1.1 Surface Gas

The highest reported concentration of methane was 6.2 ppm measured at Point 1 of transect J during the August 2024 monitoring event. All readings were well below the threshold level for further investigation and corrective action of 500 ppm.

All transects were sampled this reporting period.

Methane levels have consistently remained extremely low at this site and surface gas monitoring results from the reporting period are summarised in **Table 6** of **Appendix A**.

5.1.2 Subsurface Gas

No readings were recorded within subsurface gas monitoring wells above 0.1 % v/v threshold value. All subsurface gas monitoring results were below the threshold for further investigation and corrective action of 1% v/v.

A summary of subsurface gas readings is provided in **Table 5** of **Appendix A**.

5.2 Stormwater

No stormwater was released during this reporting period. Sampling was undertaken from the stormwater retention basin adjacent to the Pony Club on site at each of the quarterly monitoring events. Results showed an exceedance for nitrogen (ammonia) in 75% of samples compared to the AWQG (2020) for fresh water and the SE Australia Lowland River Physical Characteristics (ANZECC 2000).

The samples collected in May 2024, August 2024, February 2025 and May 2025 after heavy rain events indicated elevated ammonia levels over the Freshwater guideline recommendation at 7.65 mg/L, 18.8 mg/L, 1.59 mg/L and 0.46 mg/L respectively, however there was no uncontrolled offsite discharge.

Monitoring results from the reporting period are summarised in **Table 4** of **Appendix A** with the following notable results presented in **Table 1.12.**

Table 1-12 Surface water monitoring notable results

			Nitrogen (Ammonia) mg/L
AWQG 2000 SE Australia Lowland River Physical Characteristics			0.02
AWQG 2000 Fresh Water (95%)			0.90
EPA Designation	Locations ID	Sample Date	
8	Stormwater adj. to Pony Club	6/05/2024	7.65
		01/08/2024	18.8
		10/02/2025	1.59
		16/052025	0.46

5.3 Leachate

No uncontrolled off-site discharges of leachate occurred during the reporting period under dry or wet weather conditions. Samples were collected from the leachate pond quarterly for electrical conductivity analysis and annually for a broader suite of analytes. All results were below the laboratory LOR or adopted guidelines for site waters.

Leachate monitoring results from the reporting period are summarised in **Table 3** of **Appendix A**.

5.4 Groundwater

5.4.1 Groundwater Levels

Groundwater levels measured at the site during the reporting period are summarised in **Table 5A** of **Appendix B** and ranged from 1.72 m below ground level (bgl) at groundwater monitoring point 12 to 5.25 m bgl at groundwater monitoring point 16. All bores were able to be measured this reporting period indicating that groundwater continues to flow consistently through the site.

5.4.2 Laboratory Results

Groundwater data tables are provided in **Table 1** of **Appendix B** with the pertinent findings summarised below:

Benzene, toluene, ethylbenzene and xylenes (BTEX) and TPH were not detected above the laboratory limit of response in any groundwater sample collected during the reporting period (refer to **Table 5B** of **Appendix B)**. PAHs were not detected above the laboratory limit of response in any sample.

A summary of heavy metals results is provided below and tabulated in **Table 1** of **Appendix B**:

Aluminium (total) concentrations ranged from 1.38 mg/L at groundwater monitoring point BH1 to 26.5 mg/L groundwater monitoring pointL GMB2. All samples were above the ANZAST 95% protection trigger level of 0.055 mg/L.

Arsenic concentrations were reported below the adopted performance criteria of 0.024 mg/L.

Barium and mercury were reported at concentrations below the adopted performance criteria for all samples. Cadmium (total) concentrations at all monitoring points were also below the freshwater guideline value of 0.0002 mg/L.

Chromium (hexavalent) was not detected above the laboratory limit of response in all groundwater samples collected during the reporting period. However, Chromium (Total) levels were above the guideline value of 0.0033 mg/L on four occasions at Point 6 (0.009 mg/L), 13 (0.041 mg/L),14 (0.005 mg/L) and 16 (0.10 mg/L).

Cobalt levels were generally below the adopted performance criteria of 0.0028 mg/L with the exception being at Point 6 (0.005 mg/L). Copper (total) concentrations were not detected above the adopted performance criteria of 0.014 mg/L.

Three lead (total) concentrations were all recorded above the threshold criteria for freshwater (0.0034 mg/L). Point 12, 13 and Point 16 were 0.005 mg/L, 0.009 mg/L and 0.006 mg/L respectively.

Manganese and zinc concentrations were below the adopted performance criteria.

Specific trigger values were not provided in the adopted performance criteria for calcium, magnesium and potassium.

A summary of inorganics is provided below and tabulated in **Table 1** of **Appendix A**:

Ammonia concentrations ranged from below the laboratory LOR (multiple samples) to 0.70 mg/L at Point 14. All samples were under the threshold level for freshwater at 0.9 mg/L.

Fluoride was below the laboratory LOR in all samples and were therefore below the adopted performance criteria

Nitrate concentrations ranged from below laboratory LOR to 1.76 mg/L at Point 15, below the adopted performance criteria of 2.6 mg/L.

Specific trigger values were not provided in the adopted performance criteria for alkalinity, chloride, nitrite, sodium, TDS, TOC and sulfate.

A summary organochlorine pesticides is provided below and tabulated in **Table 1** of **Appendix A**:

OCP contaminants aldrin and dieldrin, chlordane, dichlorodiphenyltrichloroethane (DDT), endrin, lindane and heptachlor were not detected above the laboratory limit of response in any sample, however, it is noted that the adopted criteria were below the laboratory limit of response. Therefore the results cannot be screened against the criteria.

A summary organophosphorus pesticides is provided below and tabulated in **Table 1** of **Appendix A**.

OPP contaminants azinophos methyl, chlorpyrifos, diazinon, dimethoate, malathion, methyl parathion and parathion were not detected above the laboratory limit of response in any sample.

Bromophos-ethyl, carbophenothion, chlorfenvinphos, dichlorvos, ethion, fenthion, fethyl parathion, monocrotophos, fenamiphos and pirimphos-ethyl were not detected above the laboratory limit of response and were therefore below the adopted performance criteria.

pH ranged from 4.1 (point 7) to 6.6 (Point 6) (refer to **Table 1** of **Appendix A**). This is consistent with previous years.

5.5 Trade Wastewater

Trade wastewater data tables are provided in **Table 6** of **Appendix A** with the pertinent findings summarised below.

Trade wastewater monitoring was undertaken six times during the reporting period. The results of monitoring showed that on every occasion the volume discharge, pH, ammonia (as N), suspended solids, total dissolved solids, temperature and iron were within acceptable criteria provided in the *Consent* (Sydney Water, 2023).

5.6 Waste Tyres

Section 3 (L3.2), (L3.3) and (L3.4) of the EPL provides limitations on the size and number of waste tyres that can be disposed of at the premises. The Site has ceased operation and therefore does not receive waste tyres.

5.7 Odour

No complaints were received by Council from members of the public during the reporting period relating to offensive odour detected at an offsite location.

6 Quality Assurance/Quality Control (QA/QC)

A summary of the results of the QA/QC results are included in the following section.

6.1 Laboratory QA/QC

The selected analytical laboratory, ALS Environmental, undertake internal QA/QC procedures which include the analysis of method blanks, internal duplicate samples, laboratory control samples, matrix spikes and surrogate recovery. Additionally, laboratory QA/QC measures include receipt, logging, storage, preservation, holding time and analysis of samples within the method specified.

A review of the laboratory QA/QC procedures indicates that laboratory QA/QC procedures were within specified ranges for all samples with the exception of four duplicates, three laboratory control samples and four matrix spikes. In addition, eight matrix spike recoveries were unable to be determined as the background level was greater than or equal to the 4 times the spike level, and one laboratory control spike recovery which was greater than the upper control limit.

6.2 Data Useability

The data validation process of field and laboratory QA/QC data indicates that the reported analytical results are representative of the conditions at the sample locations and that the analytical data can be relied upon for the purpose of the Annual Report for EPL 5861.

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7 Discussion

The data and information gathered during the reporting period is discussed below in consideration of the performance criteria. In addition, and in accordance with Section 6 (R1.8) of EPL 5861, historical results have been tabulated and presented in graphical format that compares data from at least five years (where available).

Trend graphs are provided in **Appendix C** and summarised below in the sections below, however, discussion has not been provided for OCP, OPP, PAH, BTEXN or Phenolics as these contaminants have not been detected above the laboratory limit of response.

7.1 Surface Gas

Surface gas monitoring completed during the reporting period did not identify surface methane concentrations that exceeded the threshold level. Non-conformances of the EPL did not occur during the reporting period with respect to surface gas.

7.2 Subsurface Gas

Subsurface gas monitoring completed during the reporting period did not identify subsurface methane at concentrations that exceeded the threshold level. As such non-conformances of the EPL did not occur during the reporting period with respect to subsurface gas.

7.3 Stormwater

No discharges of stormwater from the site's stormwater system occurred during the reporting period and therefore additional monitoring was not required. As such non-conformances of the EPL did not occur with respect to stormwater.

7.4 Leachate

There were no uncontrolled discharge off-site or exceedances above the adopted performance criteria during the reporting period for heavy metals. Concentrations reported were for total metals in accordance with the EPL requirement, however, it is important to note that the adopted screening criteria recommended by the *Environmental Guidelines* (EPA 2016) are intended for application to concentrations of dissolved metals. As such, when exceedances occur, they are not necessarily indicative of environmental concern with the contaminant concentrations most likely attributed to the presence of sediment in unfiltered samples.

Ammonia was reported above the ANZAST 95% protection trigger level. Given the nature of leachate at landfill sites an elevated concentration of ammonia is not unexpected. The sample was collected from a leachate pond located on Site and is not representative of water exiting the Site.

No uncontrolled releases of contaminated leachate occurred during the reporting period under dry weather or storm events. As such non-conformances of the EPL did not occur with respect to releases of leachate.

7.5 Surface Water

The surface water samples collected from Point 8 (pony club) had pH levels within range (6.5-8.5).

Ammonia levels were elevated from the previous reporting period, most likely influenced by rainfall events. No leachate overflows from the site were recorded, however there may be some influence from overflow waters from the nearby sullage depot. Levels of Total Dissolved Solids were also elevated (above 50 mg/L) due to continuing heavy rainfall events.

Thermotolerant coliforms levels during this period fluctuated between 10 cfu/100 ml – 1000 cfu/100 ml, most likely linked to sullage depot overflows.

7.5.1 Trend Analysis

A series of graphs showing trends in surface water contaminant and parameter levels are provided in **Appendix B** and are discussed below. It appears that the hydrological system continues to strongly flow throughout the site after two years of heavy rainfall.

Dissolved oxygen, redox potential, potassium, and TOC all remained within normal limits and fluctuated due to seasonal variations as well as the sporadic rainfall events.

No overflow events were recorded during this reporting period.

7.6 Groundwater

7.6.1 Groundwater Level

Interpretation of groundwater levels across the Site from the reporting period indicate that the inferred groundwater flow direction is from the west to the north east, which is consistent with the local topography and is shown on **Figure 2**. Groundwater is situated at the greatest depths in the higher elevations of the Site toward the western boundary and is shallowest toward the eastern boundary in close proximity to the nearest surface water body, the Hacking River. With continuing heavy rainfall, the monitoring points at higher elevations along the western and southern boundaries continue to flow resulting in an overall decrease in analyte concentrations in the water column across the Site.

7.6.1.1 Trend Analysis

A series of graphs showing groundwater analyte trends are provided in **Appendix B** and discussed below.

7.6.2 Laboratory Results

Groundwater analysis completed during the reporting period showed that most contaminants and parameters of interest specified in EPL 5861 were below the laboratory limit of response or the performance criteria, including BTEX, TPH, PAH, fluoride and nitrate. Performance criteria are not provided for alkalinity, chloride, sodium, TDS, TOC and sulphate; however, the results were generally comparable with historical data and are not considered unusual or concerning in the context of the Site use as an operational landfill.

Heavy metal concentrations were reported above the adopted performance criteria during the reporting period for heavy metals including aluminium, cadmium chromium (total), copper, lead and zinc. Concentrations reported were for total metals in accordance with the EPL requirement, however, it is important to note that the adopted screening criteria recommended by the *Environmental Guidelines* (EPA 2016) are intended for application to concentrations of dissolved metals.

7.6.2.1 Trend Analysis

A discussion has not been provided for OCP, OPP, PAH, BTEXN or Phenolics as these contaminants have never been reported above the laboratory limit of response.

A series of graphs showing trends in groundwater contaminant and parameter levels are provided in **Appendix C** and are discussed below.

The trend graphs show that contaminant and parameter concentrations have remained steady and relatively consistent with the four years prior, with a general decline in contaminant concentrations (except for total metals).

The heavy rainfall events of the previous reporting period, coupled with continuing rainfall in this period have impacted on water levels throughout the Site, with the stormwater and leachate ponds maintaining high levels. Groundwater levels have also risen significantly and remain steady.

7.7 Trade Wastewater

Trade wastewater was discharged into the sewer network in accordance with the Consent (Sydney Water 2023) with no non-conformances during the reporting period.

7.8 Waste Tyres

The Site has ceased operation and therefore does not receive waste tyres. As such, non-conformances of the EPL did not occur during the period with respect to waste tyres.

7.9 Odour

No complaints were received by Council from members of the public during the reporting period relating to offensive odour detected at an offsite location. As such non-conformances of the EPL did not occur during the reporting period with respect to odour.

7.10 Conceptual Site Model

Generally, a conceptual site model (CSM) provides an assessment of the fate and transport of contaminants of potential concern (CoPC) relative to site specific subsurface conditions with regard to their potential risk to human health and the environment. The CSM takes into account site-specific factors including:

- Source(s) of contamination;
- Identification of CoPC associated with past (and present) source(s);
- Vertical, lateral and temporal distribution of CoPC;
- Site specific lithologic information including soil type(s), depth to groundwater, effective porosity, and groundwater flow velocity; and
- Actual or potential receptors considering both current and future land use both for the site and adjacent properties, and any sensitive ecological receptors.

Based on the results discussed in this report a CSM has been developed and is outlined below in **Table 1-13**. Additional details are included in the sections that follow as necessary.

Table 1-13 Conceptual Site Model

CSM Element	Description
Contaminant Sources	Known contaminant sources at the Site include: ▪ Historical use for disposal of sanitary waste including 'nightsoil' as well as putrescible waste from the 1960s to 1991. From 1991 putrescible waste ceased to be accepted at the Site and the permitted waste was limited to "Class 2" style wastes such as furniture, wood paper, plastics (GHD, 2008). ▪ Leachate resulting from degradation of buried waste and interaction with groundwater.
Site Current and Future Use	The Site is a closed landfill that historically received waste from Wollongong City Council local government area. In accordance with site closure and the rehabilitation plan, the Site will be returned to the community in the future.
Site Geology	The Site lies within the Sydney Basin above the Illawarra escarpment and is part of the Cumberland Sub-Group of the Illawarra Coal Measures, which are Permian in age. Review of the 1:100,000 geological map 'Wollongong-Port Hacking' (Department of Mineral Resources, 1985) situates the Site on Hawkesbury Sandstone – Medium to coarse grained quartz sandstone with very minor shale and laminate lenses, which is consistent with soil samples. Test pitting completed by GHD (2008) as part of the LEMP suggests that the near surface natural geology of the area is as follows. ▪ Orange Brown Clay Sand overlying; ▪ Orange Mottled Clay Sand overlying; ▪ White Clay Sand with Red Mottled Laterite (Ironstone) Clay Sand overlying; ▪ White Loosely Cemented Sandstone (assumed to be regional bedrock).
CoPCs	The CoPCs listed in EPL 5861 include heavy metals (aluminium, arsenic, barium, cadmium, chromium (hexavalent and total), cobalt, copper, lead, manganese, mercury, zinc), polycyclic aromatic hydrocarbon, total petroleum hydrocarbons, benzene, toluene, ethylbenzene, xylenes, naphthalene, organochlorine pesticides, organophosphate pesticides and phenolics. In addition to CoPC the EPL identifies potentially hazardous landfill gasses including methane and carbon dioxide.
Extent of Impacts	The extent of potential contamination would primarily be located immediately below and down gradient of the tip face. It may also originate from upstream land uses such as mining and urban development. Monitoring undertaken during the reporting period indicates that contaminants above the adopted criteria are limited to heavy metals and ammonia in leachate and groundwater. Other CoPC were not reported above the laboratory limit of response or the adopted criteria. Methane was detected during the reporting period atop the current and previous tip face (surface gas) and subsurface, however, the concentrations were below the threshold level for further investigation and corrective action.
Potential Human Receptors	Potential human receptors include: Pony club users ▪ Trespassers who illegally access the site; ▪ Contractors undertaking site maintenance including mowing, landscaping and fence repairs; ▪ Contractors undertaking scheduled environmental monitoring (surface water, groundwater and landfill gas); and ▪ Individuals working or living within close proximity to the Site.
Potential Ecological Receptors	Potential ecological receptors include: ▪ Tributaries to the Hacking River and Wilsons Creek, located to the south east and north, respectively; ▪ The Garrawarra State Conservation Area located immediately north and east of the Site boundary;

CSM Element	Description
	▪ Groundwater under the Site being impacted as a result of the vertical migration of contaminants from leachate and buried waste; and ▪ Flora and fauna on the Site interacting with contaminants in the soils including birds scavenging and nesting at the Site.
Potential Contaminant Pathways	Potential contaminant pathways include: ▪ Dermal contact with contaminated materials including soil, waste and hazardous building materials during maintenance and potential earthworks; ▪ Dermal contact with contaminated media including surface water, groundwater and leachate during environmental monitoring; ▪ Inhalation of hazardous landfill gases emanating from buried waste and leachate; ▪ Inhalation of volatile contaminants and/or asbestos fibres; ▪ Ingestion of contaminant impacted materials including soil, waste and hazardous building materials; ▪ Potential contaminant uptake by vegetation; and ▪ Potential ingestion of contaminant impacted fresh produce (fruit and vegetables) grown down gradient of the site.

7.11 Data Gaps and Uncertainties

The assessment of potential contamination at the site is based on monthly site inspection and review of available historical reports and information. As such, the lateral and vertical extent of potential contamination in soil profile is unknown. Also, the extent that the surrounding catchment influence water quality flowing through the site also requires consideration and further investigation. This will form part of the Modification 3 site investigation works.

7.12 Future Directions

In September 2015, the EPA issued Notice of Variation requiring the final landfill capping works to be carried out in accordance with design plans that were submitted by Council. In March 2020, Council requested to implement a biofiltration management system to treat landfill gas at the premises. In April 2020, the EPA advised that it supported the 2020 Biofilter Proposal. However since 2020 a biofiltration system has not been progressed at the premises (EPA 2025).

To address this, Council advised the EPA that it intends to undertake capping and closure works in accordance with an updated design plan and management plan. In September 2024, the Council submitted documents and correspondence outlining the proposed changes to the capping design. The EPA reviewed the documentation and as a result, the EPA requires the submission of an Amended Capping and Closure Proposal by 1st October 2025 that consolidates all the previous plans.

The Proposal must:

i. include a design plan for the proposed biofiltration system;
ii. include a monitoring and maintenance program for the proposed biofiltration system, including measures to maintain biofilter media;
iii. identify leachate management measures and demonstrate sufficient capacity for a leachate treatment system;
iv. clearly identify all consistencies and changes between (1) the 2024 Design Plans Parts 1 - 4 and (2) all plans previously approved by the EPA.
iv. provide justification for all design changes identified in response to Item iv. above;
v. clearly identify and explain the proposed locations of groundwater and gas monitoring wells. This explanation must consider the need to adequately assess offsite migration of landfill gas from within and beyond the footprint of the waste;
vi. include timeframes for the completion of staged capping and closure works;

vii. include a statement prepared by a suitably qualified engineer. This statement should assess all design changes against the requirements of the NSW Landfill Guidelines.

Within three months of receiving approval of the Amended Closure Plan, Council must prepare and submit a Quality Assurance / Quality Control (QA/QC) program for the construction and installation of the approved landfill cap per the Amended Cap Design Plan.

8 Conclusions

The following can be concluded based on the monitoring undertaken during the reporting period:

Council implemented an environmental monitoring program during the 2024/2025 reporting period that satisfied the conditions and requirements of EPL 5861 and the *Consent to Discharge Industrial Trade Wastewater* (Sydney Water, 2023). This *Consent* was renewed in the previous reporting period.

Water contained in stormwater and leachate ponds was managed such that uncontrolled releases of contaminated water did not occur during the reporting period.

Monitoring results show that surface and subsurface hazardous ground gases were not present at concentrations that exceed the adopted performance criteria.

Some elevated heavy metals and ammonia were present in leachate samples collected from the leachate pond, however, this is not considered unusual in the context of the historical site use as a landfill. Leachate was contained onsite within the pond and as such the concentrations are not considered a significant risk to human or environmental receptors.

Heavy metals were detected above the performance criteria in groundwater, however, samples were submitted for analysis of total metals. Therefore, the elevated concentrations may be due to the presence of sediments.

Complaints from the public relating to offensive odours originating from the Site were not received during the reporting period.

9 Limitations

This assessment has been undertaken in accordance with Environmental Protection Licence 5861.

The assessment may not identify contamination occurring in all areas of the site or occurring after sampling was conducted. Subsurface conditions may vary considerably away from the sample locations where information has been obtained.

This assessment report is not any of the following:

A preliminary site investigation (PSI), detailed site investigation (DSI) or environmental site assessment (ESA).

A Site Audit Report or Site Audit Statement (SAR/SAS) as defined under the *Contaminated Land Management Act, 1997* or an assessment sufficient for an Environmental Auditor to be able to conclude a SAR/SAS.

A geotechnical report.

A detailed hydrogeological assessment in conformance with NSW DEC (2007) Contaminated Sites: Guidelines for the Assessment and Management of Groundwater Contamination.

A total assessment of the site to determine suitability of the entire parcel of land at the site for one or more beneficial uses of land.

10 References

ANZECC (2000), Australian Water Quality Guidelines, 2000

ANZAST (2018), Australian Water Quality Guidelines, 2018

Australian Standards (1999), AS 4482.2-1999 Guide to the Sampling and Investigation of Potentially Contaminated Soil - Volatile Substances, 1999

GHD (2008), Landfill Environmental Management Plan, Helensburgh Landfill, 2008

NEPC (2013), National Environment Protection (Assessment of Site Contamination)

Measure, 2013 NHMRC (2014), Australian Drinking Water Guidelines, 2014)

NSW EPA (1996), NSW Environmental Guidelines: Solid Waste Landfills, 1996 NSW EPA (2013), Requirements for publishing pollution monitoring data, 2013 NSW EPA (2015), Asbestos and Waste Tyre Guidelines, 2015

NSW EPA (2016), Environmental Guidelines: Solid Waste Landfills (Second Edition), 2016

NSW EPA (2017), Guidelines for the NSW Site Auditor Scheme (3rd Edition), 2017

NSW DPI (1985), 1:100,000 geological map Wollongong-Port Hacking, 1985 Sydney Water (2019), Consent to Discharge Industrial Trade Wastewater, 2019

Sydney Water (2023). Trade Waste Agreement: Helensburgh Waste Disposal Depot.

US EPA (2000), Guidance for the Data Quality Objectives Process and Data Quality Objectives Process for Hazardous Waste Site Investigations, 2000

APPENDICIES

Appendix A

Table 1: Groundwater Quality Data for the Reporting Period 2024-2025

		Alkalinity (as calcium carbonate)	Aluminium	Ammonia	Arsenic	Barium	Benzene	Cadmium	Calcium	Chloride	Chromium (hexavalent)	Chromium (Total)	Cobalt	Copper
Units		mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Site Name	Sample Date													
Monitoring Point 5	01/08/2024	8	1.38	0.01	<0.001	0.022	<1	<0.0001	10	93	<0.01	0.002	0.002	0.002
	04/11/2024	26		0.04					15	55				
	10/02/2025	30		0.05					16	49				
	06/05/2025	12		0.04					10	63				
Monitoring Point 6	01/08/2024	138	2.17	0.05	0.013	0.111	<1	<0.0001	34	18	<0.01	0.009	0.005	0.005
	04/11/2024	174		0.06					44	21				
	10/02/2025	124		0.52					33	26				
	06/05/2025	103		0.29					29	23				
Monitoring Point 7	01/08/2024	<1	3.58	<0.01	<0.001	0.024	<1	<0.0001	<1	239	<0.01	0.001	0.001	0.003
	04/11/2024	<1		0.17					<1	118				
	10/02/2025	2		0.06					1	107				
	06/05/2025	<1		0.04					<1	187				
Monitoring Point 12	01/08/2024	51	6.30	<0.01	0.006	0.025	<1	<0.0001	19	17	<0.01	0.003		0.008
	04/11/2024	105		0.01					40	21				
	10/02/2025	82		0.01					33	25				
	06/05/2025	74		0.02					29	21				
Monitoring Point 13	01/08/2024	9	26.5	0.04	0.002	0.027	<1	<0.0001	12	23	<0.01	0.041		0.009
	04/11/2024	4		0.02					19	31				
	10/02/2025	51		0.47					22	29				
	06/05/2025	11		0.02					24	38				
Monitoring Point 14	01/08/2024	7	3.66	0.06	<0.001	0.012	<1	<0.0001	7	23	<0.01	0.005		0.004
	04/11/2024	6		0.70					28	35				
	10/02/2025	10		0.45					10	34				
	06/05/2025	7		0.08					5	24				
Monitoring Point 15	01/08/2024	9	1.57	<0.01	<0.001	0.005	<1	<0.0001	10	12	<0.01	0.002		0.002
	04/11/2024	6		0.01					10	11				
	10/02/2025	7		0.03					9	14				
	06/05/2025	5		0.06					9	14				
Monitoring Point 16	01/08/2024	4	3.62	<0.01	<0.001	0.025	<1	<0.0001	5	42	<0.01	0.010		0.008
	04/11/2024	2		<0.01					8	40				
	10/02/2025	2		<0.01					5	39				
	06/05/2025	<1		0.02					7	37				

		Depth	Ethyl benzene	Fluoride	Lead	Magnesium	Manganese	Mercury	Nitrate as N	Nitrite as N	Organochlorine Pesticides	Organophosphate Pesticides
Units		Meters	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Site Name	Sample Date											
Monitoring Point 5	01/08/2024	2.82	<2	<0.1	0.002	10	0.170	<0.0001	0.05	<0.01	<0.5	<0.5
	04/11/2024	3.52				12						
	10/02/2025	3.34				12						
	06/05/2025	2.82				12						
Monitoring Point 6	01/08/2024	2.79	<2	<0.1	0.003	16	0.246	<0.0001	<0.01	<0.01	<0.5	<0.5
	04/11/2024	2.24				20						
	10/02/2025	3.60				15						
	06/05/2025	3.36				15						
Monitoring Point 7	01/08/2024	2.09	<2	<0.1	0.002	7	0.047	<0.0001	0.30	<0.01	<0.5	<0.5
	04/11/2024	4.51				5						
	10/02/2025	4.55				5						
	06/05/2025	2.98				8						
Monitoring Point 12	01/08/2024	2.02	<2	<0.1	0.005	9	0.010	<0.0001	0.27	<0.01	<0.5	<2.0
	04/11/2024	2.90				11						
	10/02/2025	2.66				9						
	06/05/2025	1.72				10						
Monitoring Point 13	01/08/2024	2.48	<2	<0.1	0.009	6	0.012	<0.0001	0.06	<0.01	<2.0	<2.0
	04/11/2024	3.37				8						
	10/02/2025	3.04				7						
	06/05/2025	2.68				9						
Monitoring Point 14	01/08/2024	2.15	<2	<0.1	0.003	3	0.008	<0.0001	0.02	<0.01	<0.5	<0.5
	04/11/2024	3.28				13						
	10/02/2025	3.30				4						
	06/05/2025	2.39				3						
Monitoring Point 15	01/08/2024	2.03	<2	<0.1	0.001	3	0.032	<0.0001	1.76	<0.01	<0.5	<0.5
	04/11/2024	2.96				4						
	10/02/2025	3.08				3						
	06/05/2025	2.40				3						
Monitoring Point 16	01/08/2024	4.30	<2	<0.1	0.006	4	0.115	<0.0001	0.28	<0.01	<0.5	<2.0
	04/11/2024	5.25				5						
	10/02/2025	5.03				5						
	06/05/2025	4.12				5						

		pH	Polycyclic aromatic hydrocarbons	Potassium	Sodium	Sulfate	Toluene	Total Dissolved Solids	Total organic carbon	Total Petroleum Hydrocarbons	Total Phenolics	Xylene	Zinc
Units		pH	µg/L	mg/L	mg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L
Site Name	Sample Date												
Monitoring Point 5	01/08/2024	5.1	<0.5	<1	47	56	<2	210	2	<20	<0.05	<2	0.094
	04/11/2024	5.4		<1	37	63		212	2				
	10/02/2025	5.4		<1	36	63		196	3				
	06/05/2025	5.0		<1	40	51		238	4				
Monitoring Point 6	01/08/2024	6.2	<0.5	3	20	21	<2	204	7	<100	<0.05	<2	0.007
	04/11/2024	6.6		7	19	11		310	12				
	10/02/2025	6.1		4	25	27		226	8				
	06/05/2025	6.0		5	26	25		236	10				
Monitoring Point 7	01/08/2024	4.1	<0.5	1	153	94	<2	444	2	<20	<0.05	<2	0.028
	04/11/2024	4.3		2	92	86		314	<1				
	10/02/2025	4.3		1	101	82		300	2				
	06/05/2025	4.2		2	139	80		468	6				
Monitoring Point 12	01/08/2024	5.4	<0.5	1	19	51	<2	146	8	<20	<0.05	<2	0.006
	04/11/2024	6.1		2	19	45		206	20				
	10/02/2025	5.9		1	22	32		190	16				
	06/05/2025	5.7		2	20	29		172	10				
Monitoring Point 13	01/08/2024	5.1	<0.5	4	22	44	<2	143	3	<20	<0.05	<2	0.027
	04/11/2024	5.2		7	21	52		220	5				
	10/02/2025	5.7		3	16	19		182	7				
	06/05/2025	5.0		4	22	63		202	5				
Monitoring Point 14	01/08/2024	5.3	<0.5	2	10	10	<2	86	<1	<100	<0.05	<2	0.016
	04/11/2024	5.2		14	16	12		104	7				
	10/02/2025	5.1		4	15	11		116	2				
	06/05/2025	4.8		2	11	10		86	3				
Monitoring Point 15	01/08/2024	4.9	<0.5	14	9	43	<2	141	2	<100	<0.05	<2	0.020
	04/11/2024	5.0		16	8	43		152	10				
	10/02/2025	4.9		12	9	32		124	3				
	06/05/2025	4.7		13	9	28		120	4				
Monitoring Point 16	01/08/2024	4.4	<0.5	2	26	20	<2	115	<1	<100	<0.05	<2	0.032
	04/11/2024	4.6		4	24	25		112	<1				
	10/02/2025	4.6		<1	26	27		125	<1				
	06/05/2025	4.3		2	23	22		116	2				

Table 2: Stormwater Results 2024-2025 Reporting Period

		Ammonia	Conductivity	Dissolved Oxygen	pH	Potassium	Redox Potential	Thermotolerant Coliforms	Total Dissolved Solids	Total organic carbon
Units		mg/L	µS/cm	mg/L	pH	mg/L	mV	CFU/100mL	mg/L	mg/L
Site Name	Sample Date									
Monitoring Point 8	01/08/2024	18.8	1090	8.56	7.7	42	199	15	820	22
	04/11/2024	0.72	868	9.51	8.2	34	182	10	486	23
	10/02/2025	1.59	785	8.25	7.8	34	128	1000	551	28
	06/05/2025	0.46	584	9.11	7.4	21	180	48	434	14

Table 3: Leachate Results 2024-2025 Reporting Period

		Alkalinity (as calcium carbonate)	Aluminium	Ammonia	Arsenic	Barium	Benzene	Cadmium	Calcium	Chloride	Chromium (Total)	Cobalt
Units		mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Site Name	Sample Date											
Leachate	01/08/2024	884	0.07	17.0	<0.001	0.004	<1	<0.0001	<1	43	<0.001	<0.001
	04/11/2024											
	10/02/2025											
	06/05/2025											

		Conductivity	Copper	Fluoride	Lead	Magnesium	Manganese	Mercury	Nitrate as N	Nitrite as N	Organochlorine Pesticides	Organophosphate Pesticides
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Site Name	Sample Date											
Leachate	01/08/2024	1660	0.003	0.2	<0.001	1	0.064	<0.0001	6.37	0.27	<0.5	<0.5
	04/11/2024	2170										
	10/02/2025	693										
	06/05/2025	1420										

		pH	Polycyclic aromatic hydrocarbons	Potassium	Sodium	Sulfate	Toluene	Total Dissolved Solids	Total organic carbon	Total Petroleum Hydrocarbons	Total Phosphorus as P	Total suspended solids	Xylene	Zinc
Units		pH	µg/L	mg/L	mg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L
Site Name	Sample Date													
Leachate	01/08/2024	7.2	<0.5	<1	7	19	<2	899	19	<100	0.02	<5	<2	0.008
	04/11/2024													
	10/02/2025													
	06/05/2025													

Table 4: Trade Waste Results 2024-2025

Date Sampled (Date)		11/06/2024	12/06/2024	01/08/2024	02/08/2024	01/10/2024	02/10/2024	03/12/2024	04/12/2024	10/02/2025	11/02/2025
Compound Name	Units										
Ammonia	mg/L		7.8		17.1		64.4		10.9		2.2
Filterable iron	mg/L		0.55		0.5		16.6		2.66		1.98
Finish Time	hrs		0.		0.		0.		0.		0.
Temperature	°C		15.		15.		18.		22.		22.
Total Dissolved Solids (Calc.)	mg/L		871.		1,050.		1,240.		559.		409.
Total suspended solids	mg/L		0.		0.		46.		8.		84.
Volume Discharged	kL		90.1		75.4		0.86		0.11		0.12
Volume Discharged (corrected)	kL		90.1		75.4		0.86		0.11		0.12
Meter Reading (start)	kL		76,697.17		80,645.51		82,259.78		82,529.93		82,536.83
Meter Reading (finish)	kL		76,787.3		80,720.96		82,260.64		82,530.04		82,536.95
pH (start)	pH	7.4		7.1		7.3		7.4		8.7	
pH (finish)	pH		7.4		7.2		7.2		7.6		8.6
Ammonia kg/day	kg/day		0.70278		1.28934		0.05538		0.0012		0.00026
Filterable iron kg/day	kg/day		0.04956		0.0377		0.01428		0.00029		0.00024
Total Dissolved Solids (Calc.) kg/day	kg/day		78.4771		79.17		1.0664		0.06149		0.04908
Total suspended solids kg/day	kg/day		0.		0.		0.03956		0.00088		0.01008

Table 5: Subsurface Gas Results 2024-2025 Reporting Period

			CH4	CH4 Peak	CO2	CO2 Peak	SWL
Units			%v/v	%v/v	%v/v	%v/v	Meters
Monitoring Point ID	Sample ID	Sample Date	Result	Result	Result	Result	Result
17	LGB5	2/08/2024	<0.1	<0.1	7.2	7.2	DRY
		7/11/2024	<0.1	<0.1	8.0	8.0	DRY
		10/02/2025	<0.1	<0.1	7.7	7.7	DRY
		6/05/2025	<0.1	<0.1	7.1	7.1	DRY
18	LGB6	2/08/2024	<0.1	<0.1	0.9	1.4	2.60
		7/11/2024	<0.1	<0.1	3.9	6.1	3.27
		10/02/2025	<0.1	<0.1	0.9	1.4	3.16
		6/05/2025	<0.1	<0.1	0.6	0.6	2.50
19	LGB7	2/08/2024	<0.1	<0.1	8.0	8.0	3.02
		7/11/2024	<0.1	<0.1	12.1	12.1	3.71
		10/02/2025	<0.1	<0.1	14.6	14.7	3.47
		6/05/2025	<0.1	<0.1	6.0	9.0	3.02
20	LGB8	2/08/2024	<0.1	<0.1	0.3	1.0	2.42
		7/11/2024	<0.1	<0.1	0.2	0.3	3.31
		10/02/2025	<0.1	<0.1	0.1	0.3	3.19
		6/05/2025	<0.1	<0.1	0.2	0.2	2.60
21	LGB9	2/08/2024	<0.1	<0.1	2.8	2.8	2.15
		7/11/2024	<0.1	<0.1	5.3	5.3	3.40
		10/02/2025	<0.1	<0.1	5.4	5.4	3.52
		6/05/2025	<0.1	<0.1	2.4	2.4	2.81
4	LFGMB1	2/08/2024	<0.1	<0.1	2.8	2.8	2.03
		7/11/2024	<0.1	<0.1	0.6	0.9	2.90
		6/05/2025	<0.1	<0.1	0.6	0.8	1.72
	LGFMB1	10/02/2025	<0.1	<0.1	0.2	1.1	2.67

Table 6: Surface Gas Results 2024-2025 Reporting Period

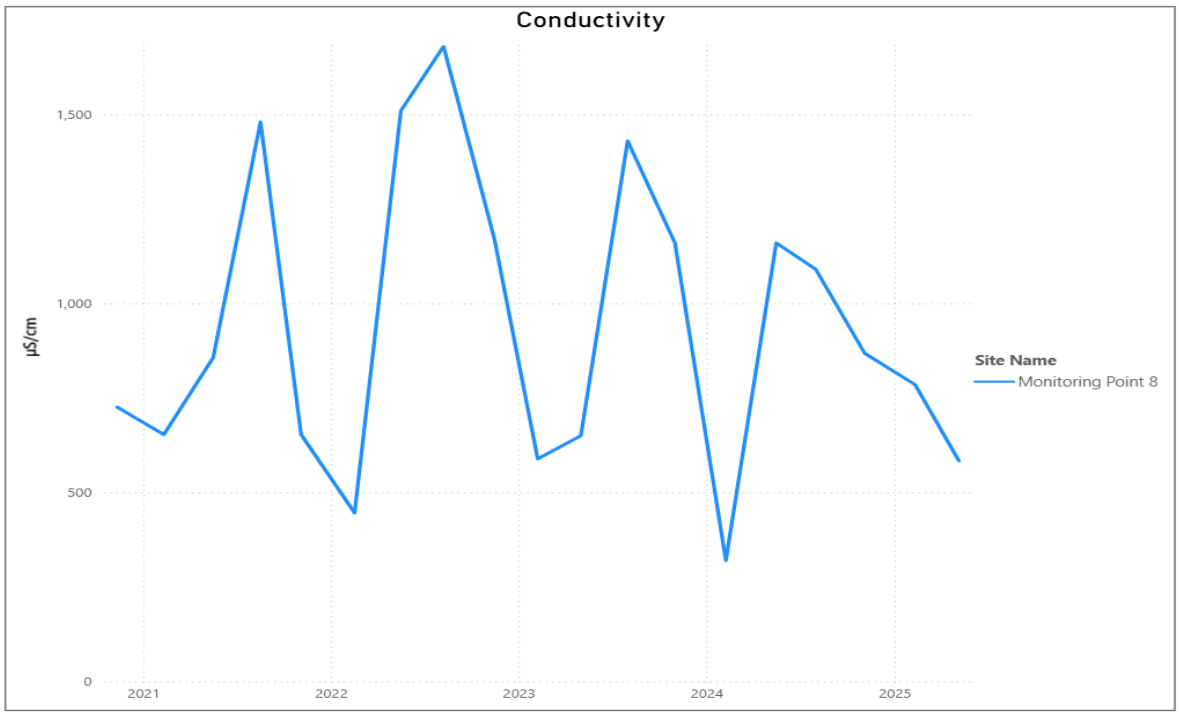
Client	Wollongong City Council		Date	21/08/2024	
Site	Helensburgh Landfill				
Transect / Location	Point	GPS North	GPS East	CH4 Conc (ppm)	Comments
Transect A	1	6216101	315915	0.0	
Transect A	2	6216103	315892	0.0	
Transect A	3	6216106	315860	0.1	
Transect A	4	6216108	315829	0.0	
Transect A	5	6216111	315803	0.0	
Transect A	6	6216113	315786	0.1	
Transect B	1	6216125	315813	0.1	
Transect B	2	6216123	315831	0.0	
Transect B	3	6216125	315855	0.0	
Transect B	4	6216123	315878	0.0	
Transect B	5	6216123	315898	0.0	
Transect B	6	6216123	315920	0.0	
Transect C	1	6216207	315768	0.0	
Transect C	2	6216194	315770	0.0	
Transect C	3	6216173	315776	0.1	
Transect C	4	6216155	315780	0.0	
Transect C	5	6216140	315785	0.1	
Transect C	6	6216128	315793	0.0	
Transect D	1	6216178	315872	0.0	
Transect D	2	6216172	315862	0.5	
Transect D	3	6216172	315854	0.0	
Transect D	4	6216174	315847	0.0	
Transect D	5	6216169	315837	0.0	
Transect E	1	6216330	315785	0.1	
Transect E	2	6216312	315787	0.0	
Transect E	3	6216291	315800	0.0	
Transect E	4	6216269	315807	0.0	
Transect E	5	6216247	315816	0.0	
Transect E	6	6216223	315818	1.1	
Transect E	7	6216204	315820	0.0	
Transect F	1	6216384	315661	0.1	
Transect F	2	6216389	315681	0.0	
Transect F	3	6216389	315698	0.1	
Transect F	4	6216383	315713	0.1	
Transect F	5	6216371	315743	0.0	
Transect G	1	6216134	315936	0.1	
Transect G	2	6216164	315937	0.0	
Transect G	3	6216195	315930	0.0	
Transect G	4	6216234	315927	0.0	
Transect G	5	6216264	315911	0.0	
Transect G	6	6216292	315923	0.0	
Transect G	7	6216317	315936	0.0	

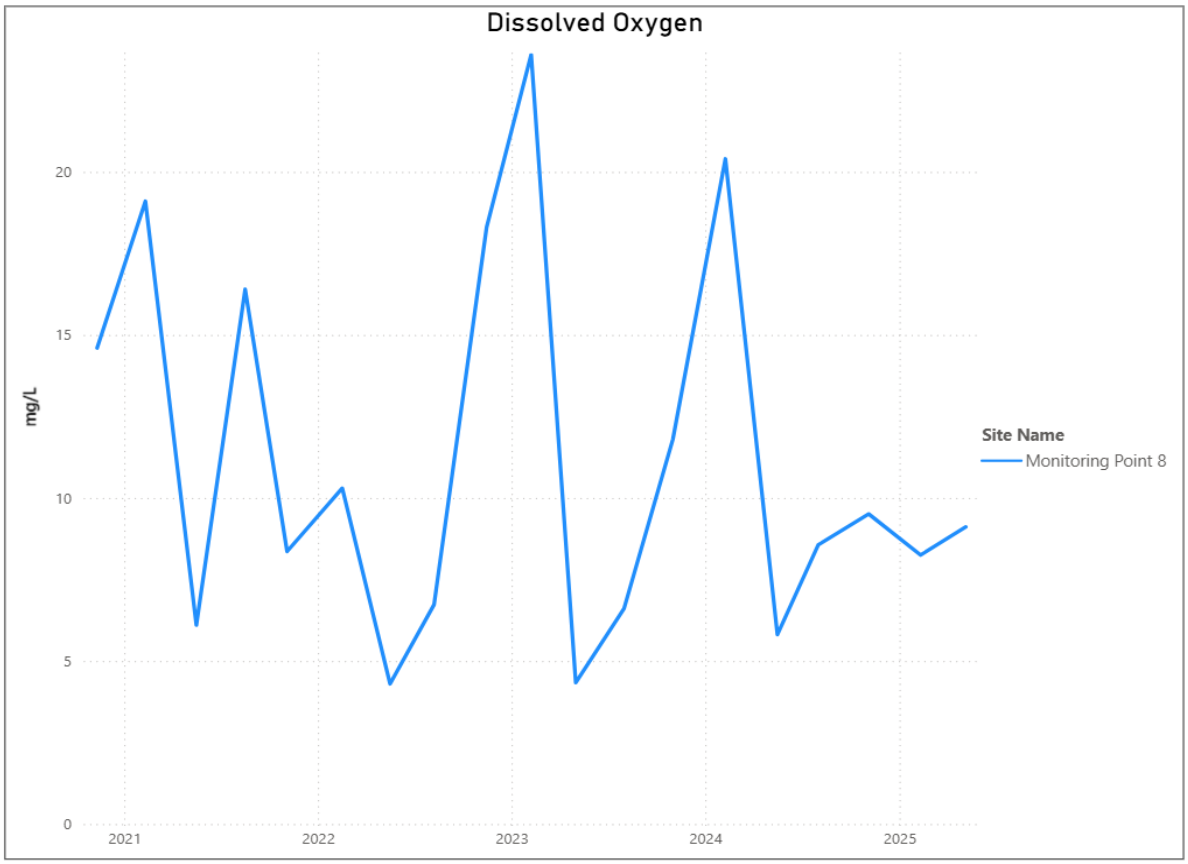
Client	Wollongong City Council		Date	21/08/2024	
Site	Helensburgh Landfill				
Transect / Location	Point	GPS North	GPS East	CH4 Conc (ppm)	Comments
Transect H	1	6216319	315887	0.1	
Transect H	2	6216286	315881	0.0	
Transect H	3	6216264	315879	0.0	
Transect H	4	6216240	315882	0.0	
Transect H	5	6216220	315885	0.1	
Transect H	6	6216194	315887	0.0	
Transect I	1	6216360	315876	0.0	
Transect I	2	6216344	315872	0.1	
Transect I	3	6216323	315865	0.0	
Transect I	4	6216303	315866	0.1	
Transect I	5	6216285	315868	0.0	
Transect I	6	6216270	315865	0.0	
Transect I	7	6216251	315866	0.5	
Transect I	8	6216232	315868	0.1	
Transect I	9	6216208	315870	0.1	
Transect J	1	6216218	315855	6.2	
Transect J	2	6216237	315856	0.1	
Transect J	3	6216261	315853	0.0	
Transect J	4	6216282	315852	0.1	
Transect J	5	6216319	315849	0.1	
Transect J	6	6216346	315850	0.1	
Transect K	1	6216399	315652	0.0	
Transect K	2	6216412	315681	0.0	
Transect K	3	6216423	315709	0.1	
Transect K	4	6216429	315746	0.1	
Transect K	5	6216432	315786	0.0	
Transect K	6	6216434	315813	0.1	
Transect K	7	6216427	315843	0.1	
Transect L	1	6216382	315878	0.1	
Transect L	2	6216415	315881	0.0	
Transect L	3	6216440	315869	0.1	
Transect L	4	6216462	315838	0.1	
Transect L	5	6216455	315815	0.1	
Transect L	6	6216435	315700	0.0	
Transect L	7	6216429	315662	0.0	
Transect L	8	6216414	315644	0.1	

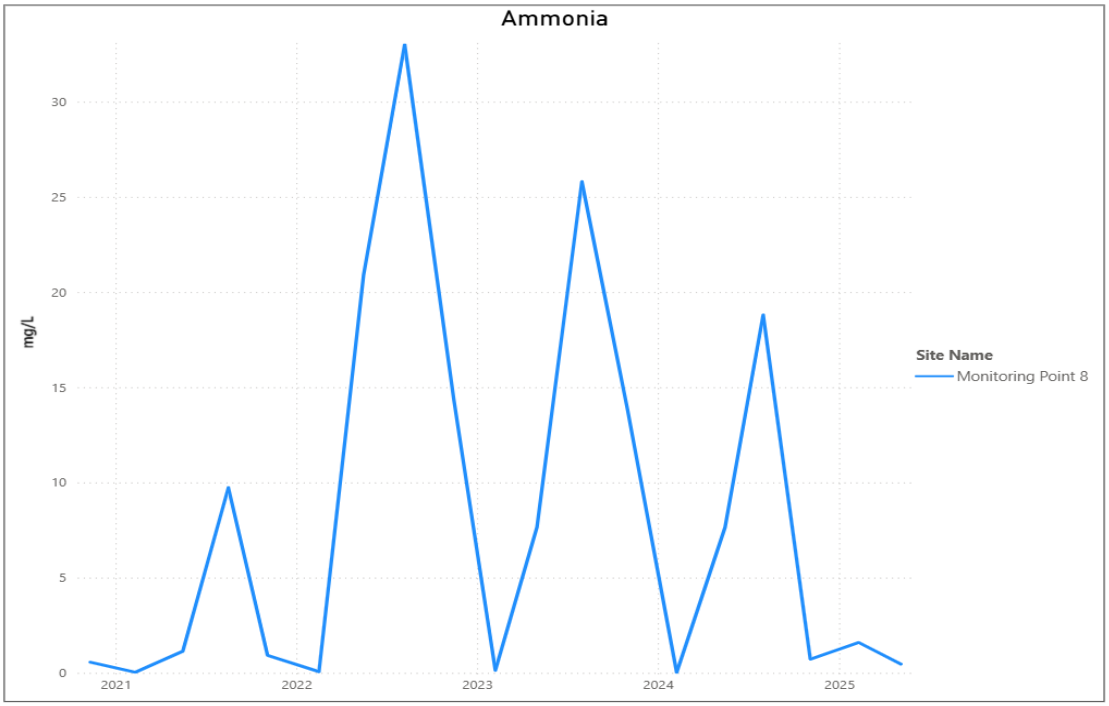
Client	Wollongong City Council		Date	21/08/2024	
Site	Helensburgh Landfill				
Transect / Location	Point	GPS North	GPS East	CH4 Conc (ppm)	Comments
Transect M	1	6216480	315785	0.0	
Transect M	2	6216468	315753	0.1	
Transect M	3	6216455	315708	0.1	
Transect M	4	6216451	315681	0.0	
Transect M	5	6216449	315669	0.0	
Transect M	6	6216442	315655	0.0	
Transect M	7	6216436	315641	0.0	
Transect M	8	6216433	315629	0.0	
Transect N	1	6216307	315922	0.1	
Transect N	2	6216309	315913	0.0	
Transect N	3	6216312	315900	0.1	
Methane Blank	Pre Testing	Taken at Entrance	Taken at Entrance	0.0	
Methane Blank	Post Testing	Taken at Entrance	Taken at Entrance	0.0	
O	1	6216357	315881	0.1	
O	2	6216351	315889	0.1	
O	3	6216348	315894	0.0	
O	4	6216349	315899	0.0	
O	5	6216347	315914	0.0	
O	6	6216343	315924	0.1	
O	7	6216339	315937	0.0	
O	8			0.1	
P	1	6216366	315869	0.0	
P	2	6216375	315877	0.1	
P	3	6216379	315895	0.0	
P	4	6216379	315916	0.0	
P	5	6216374	315933	0.0	
P	6	6216373	315945	0.0	
Q	1- Nixon Pl Fenceline adjoining landfill	6216315	315549	0.0	
Q	69- Halls Rd Fenceline adjoining landfill	6216149	315528	0.0	
Q	75- Halls Rd Fenceline adjoining landfill	6216183	315535	0.0	
Q	77- Halls Rd Fenceline adjoining landfill	6216216	315540	0.1	
Q	79- Halls Rd Fenceline adjoining landfill	6216258	315548	0.0	
Q	81- Halls Rd Fenceline adjoining landfill	6216289	315554	0.0	
Weighbridge office	1			0.0	

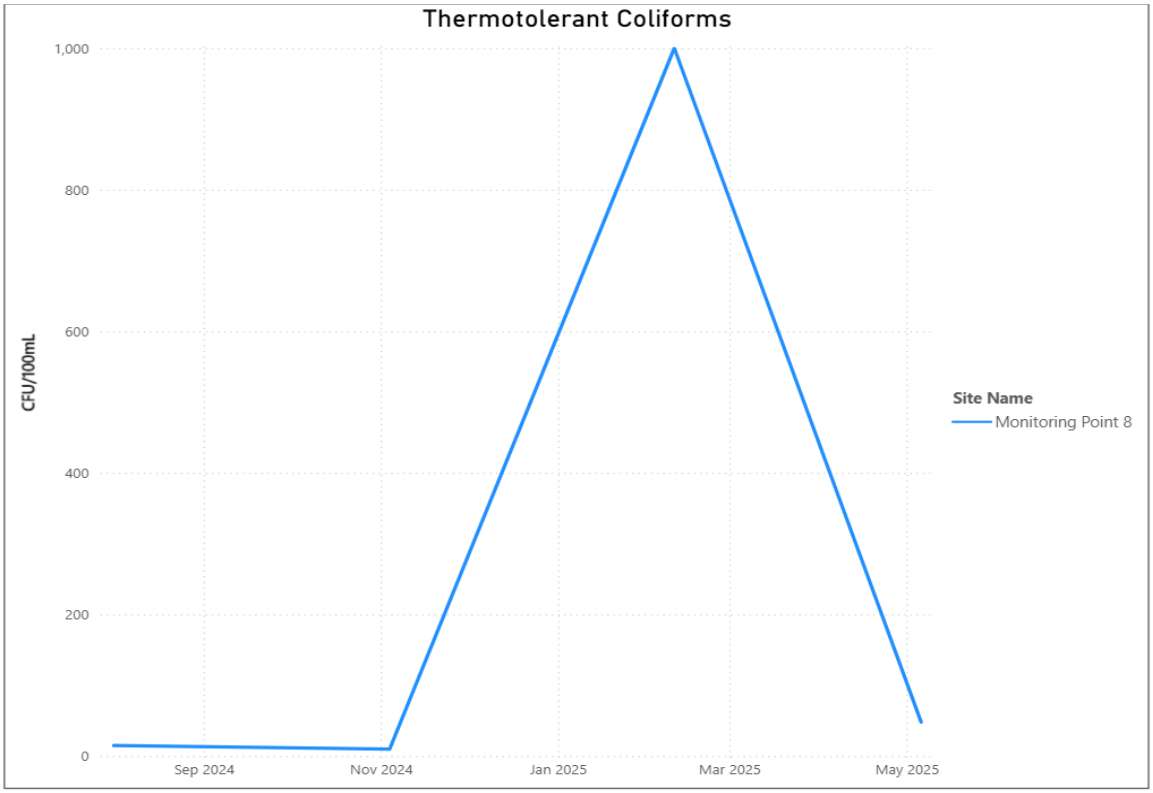
Appendix B

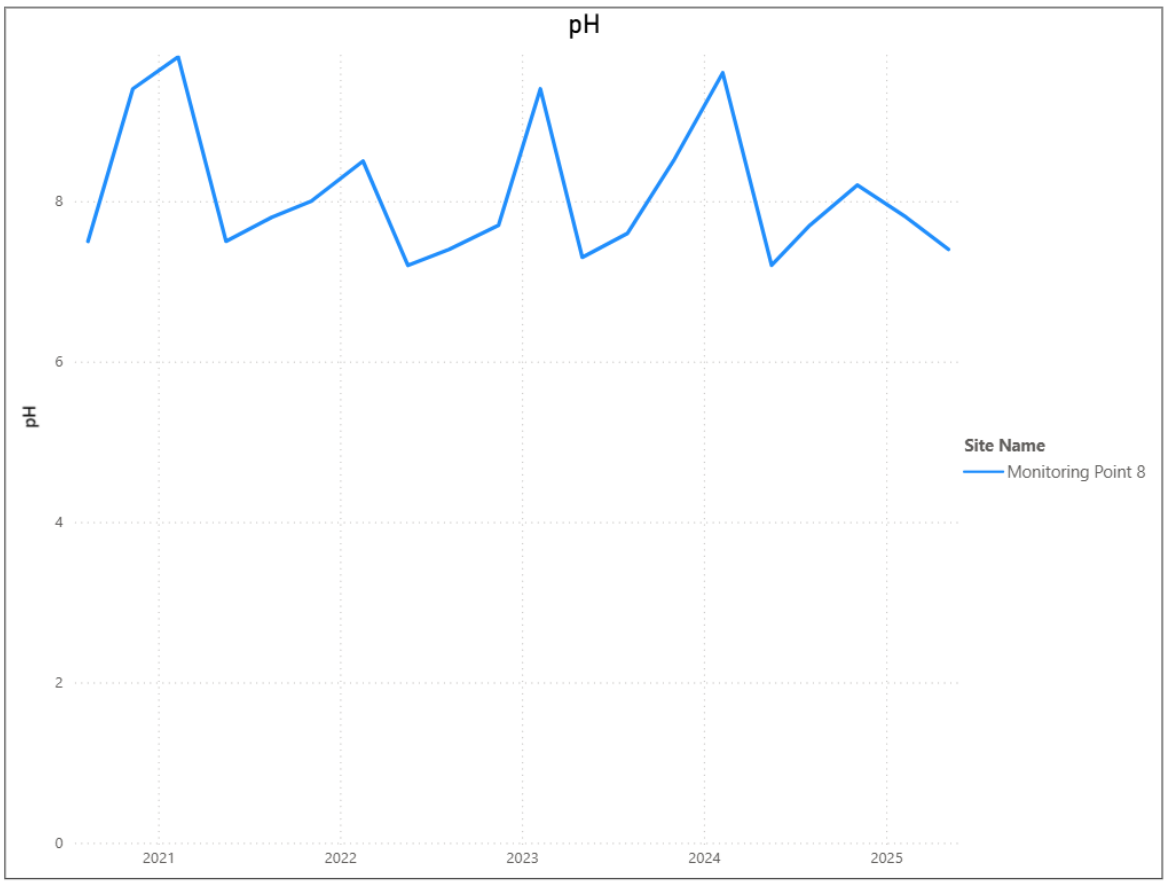
Helensburgh Surface Water Annual Results Including 2024/25 Reporting Period

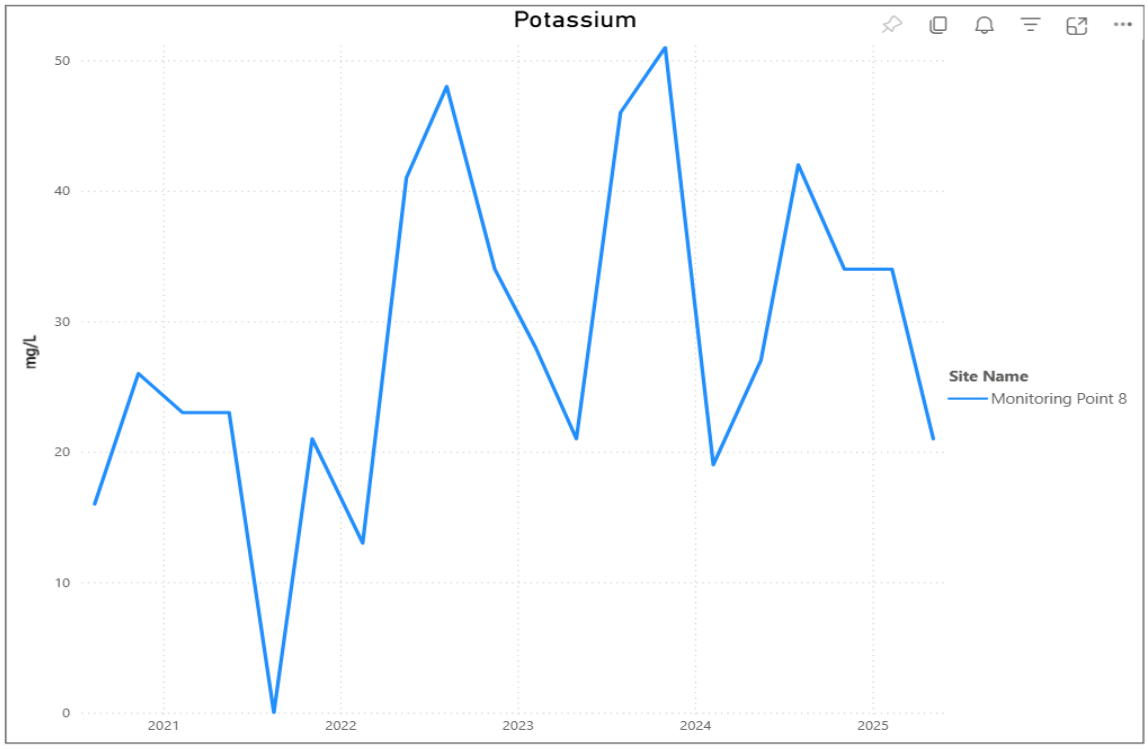


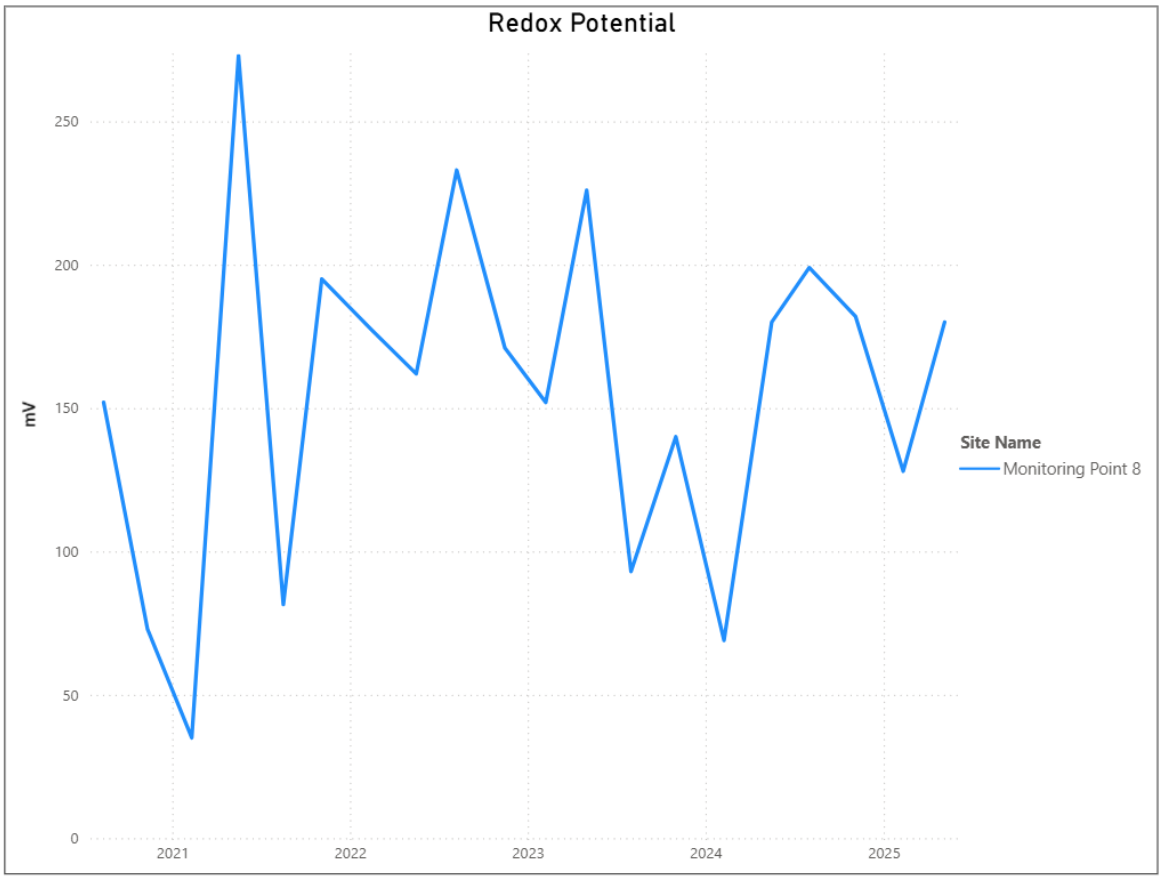


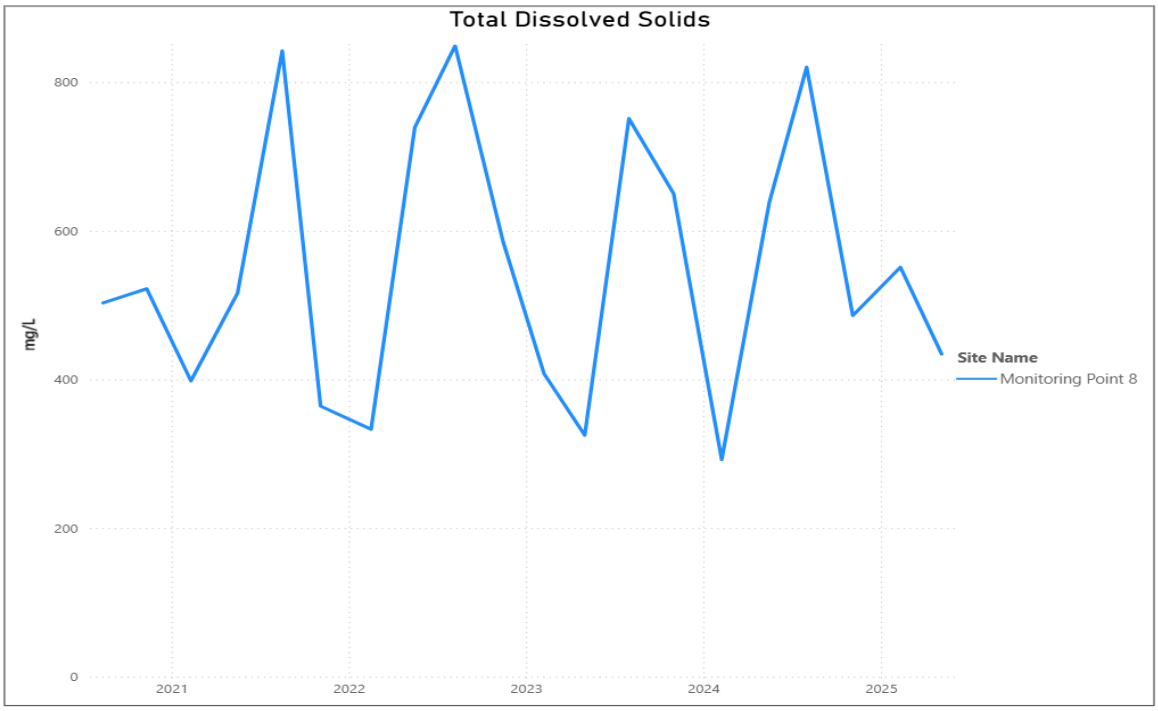


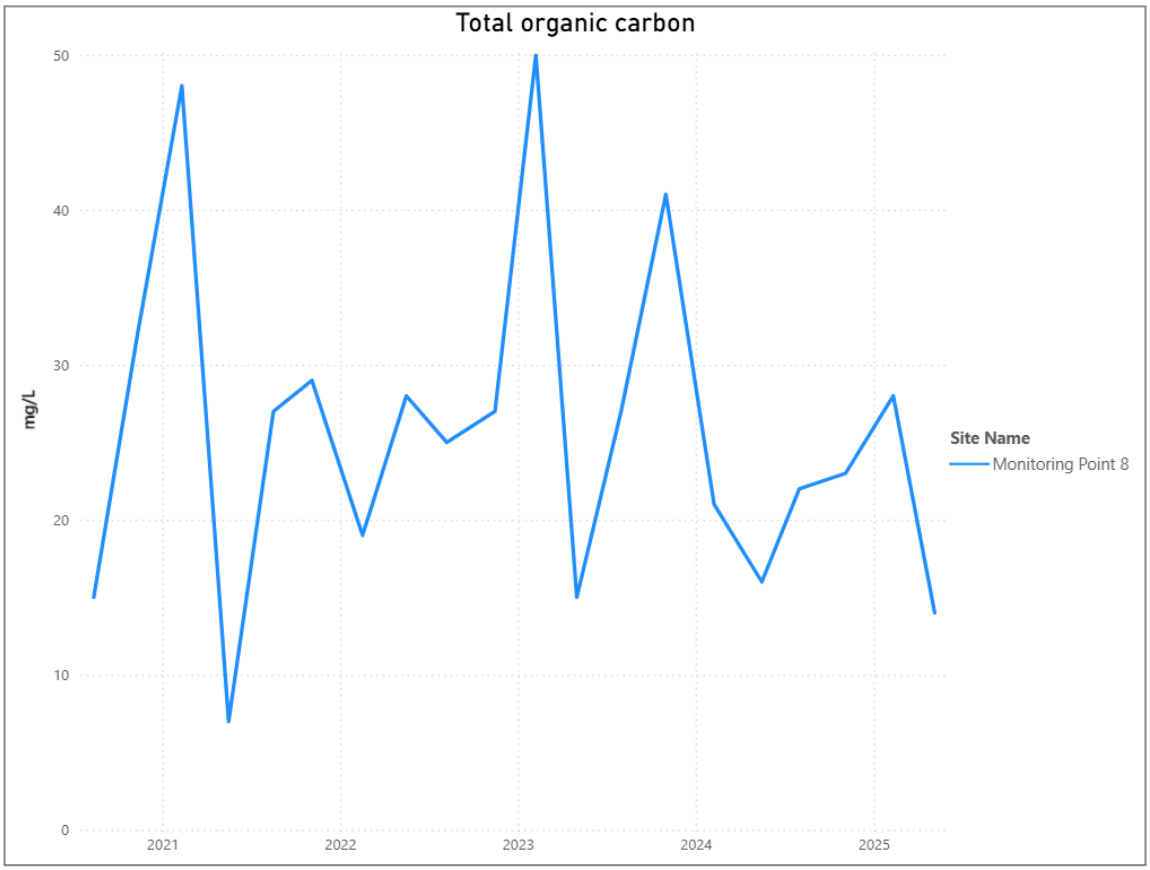




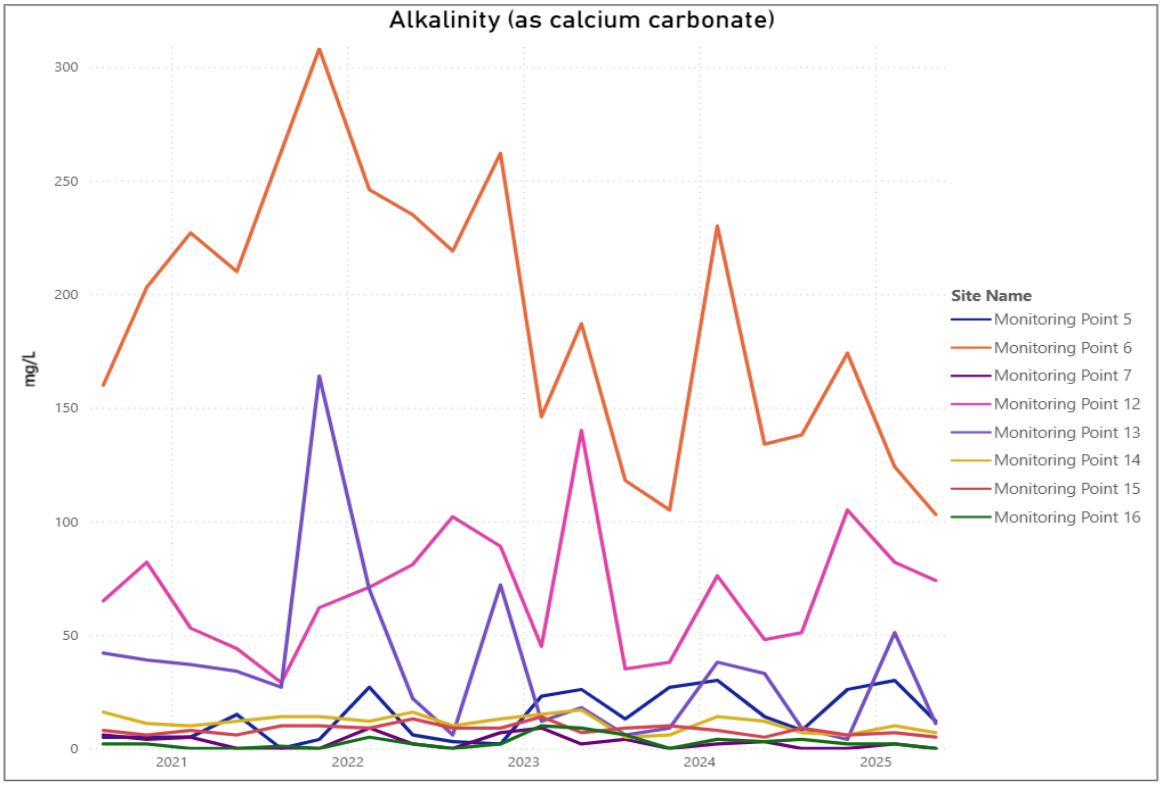


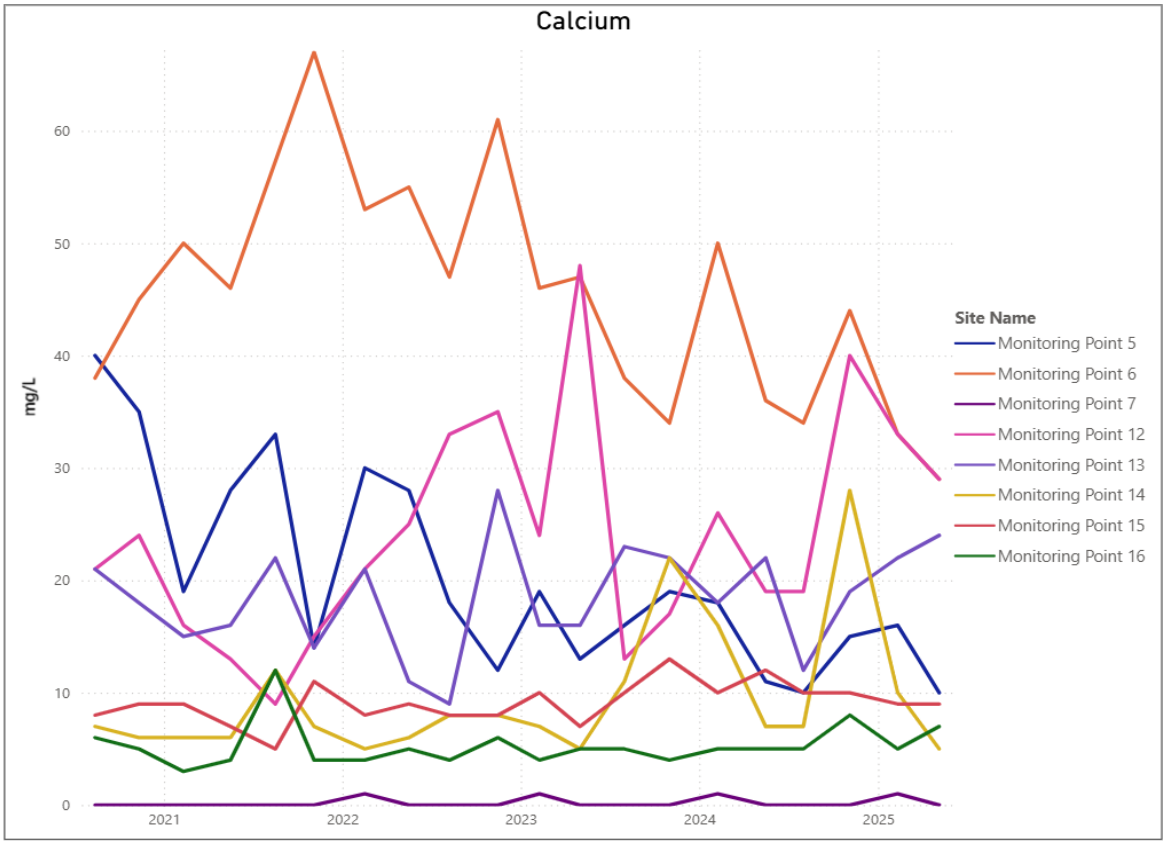


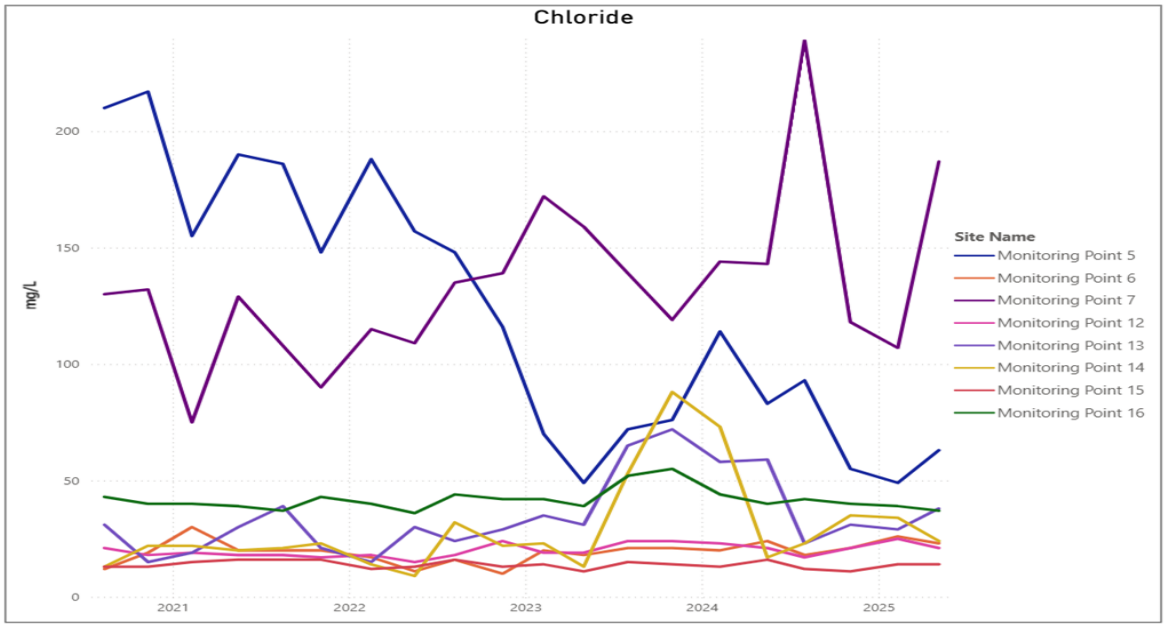


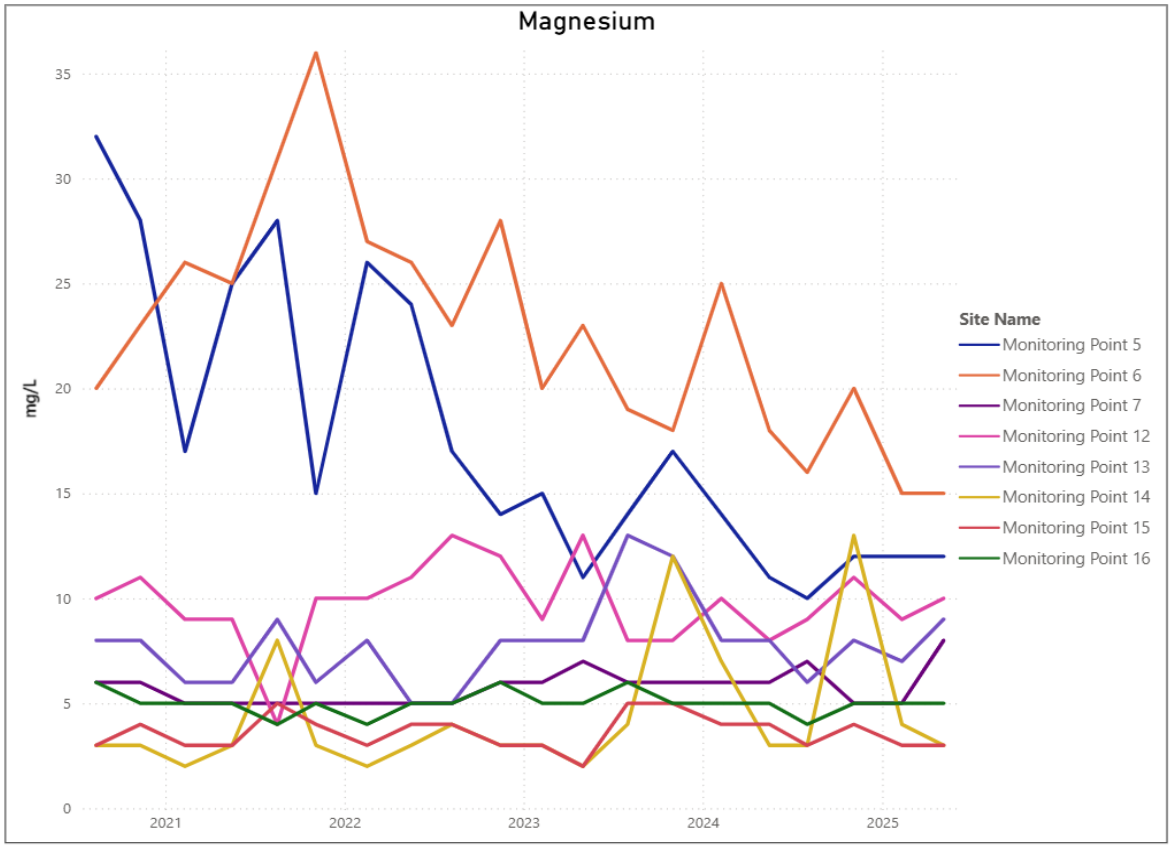


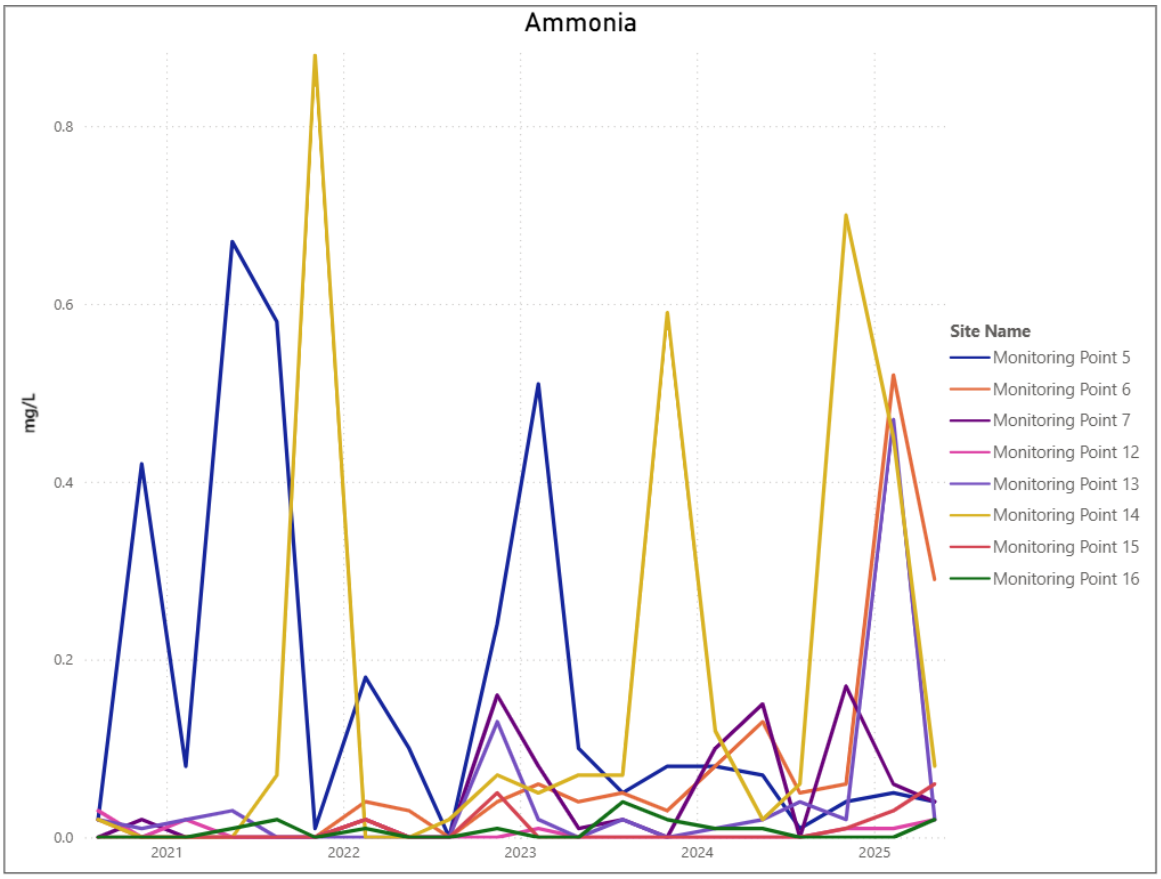
Helensburgh Quarterly Groundwater Results Including 2024/25 Reporting Period

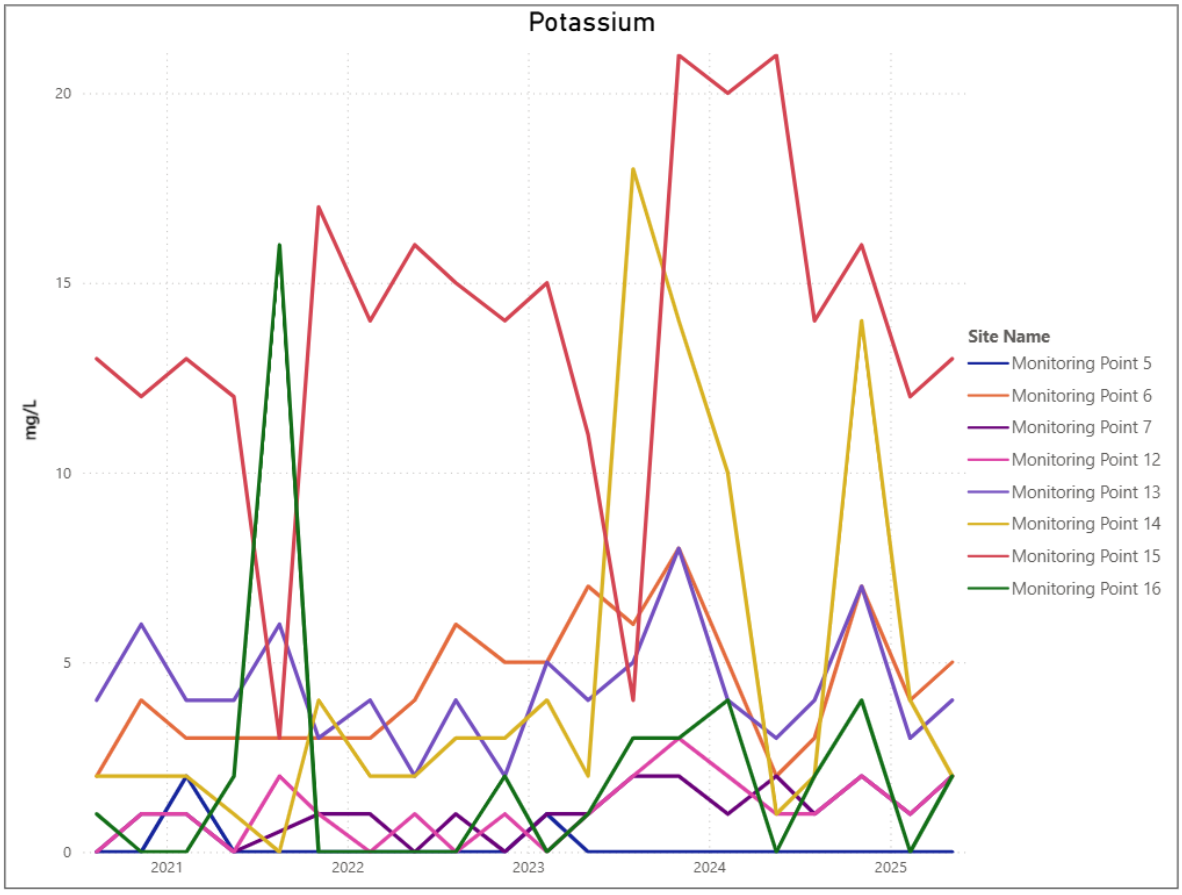


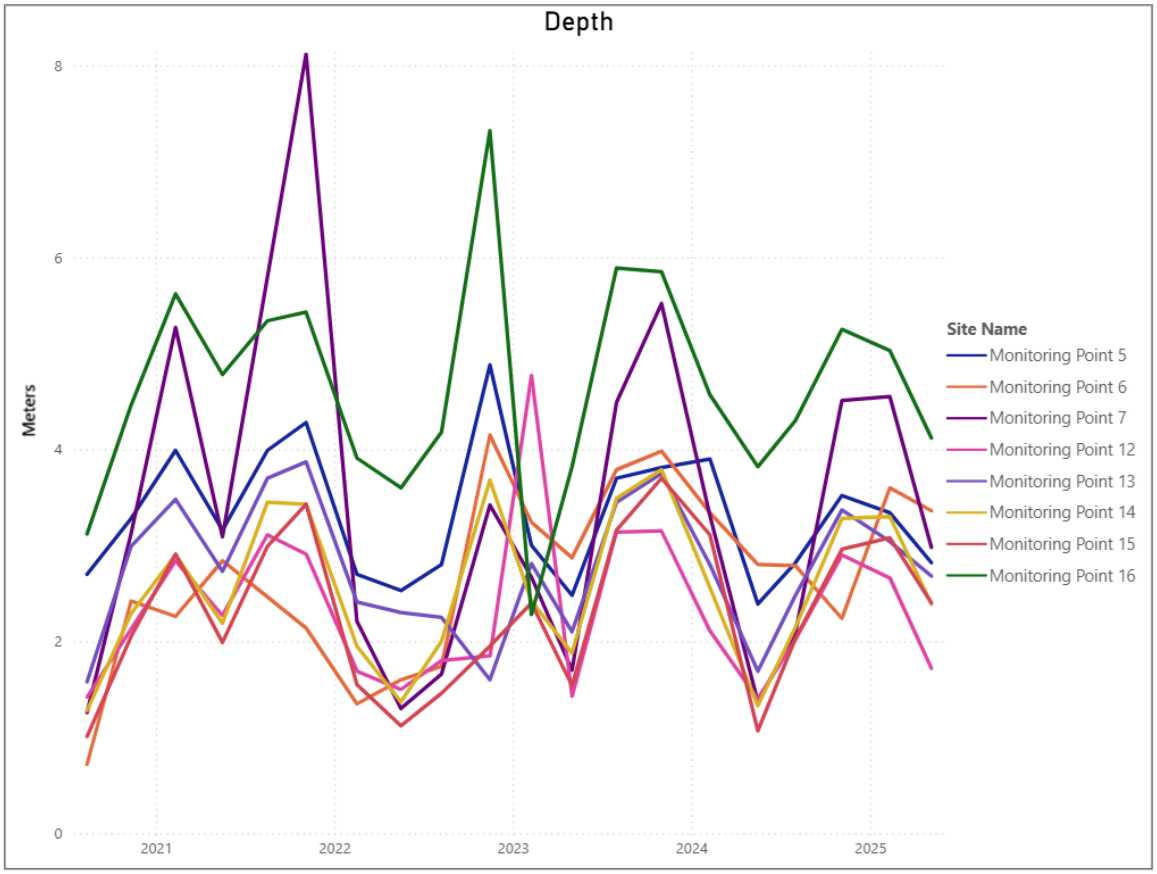


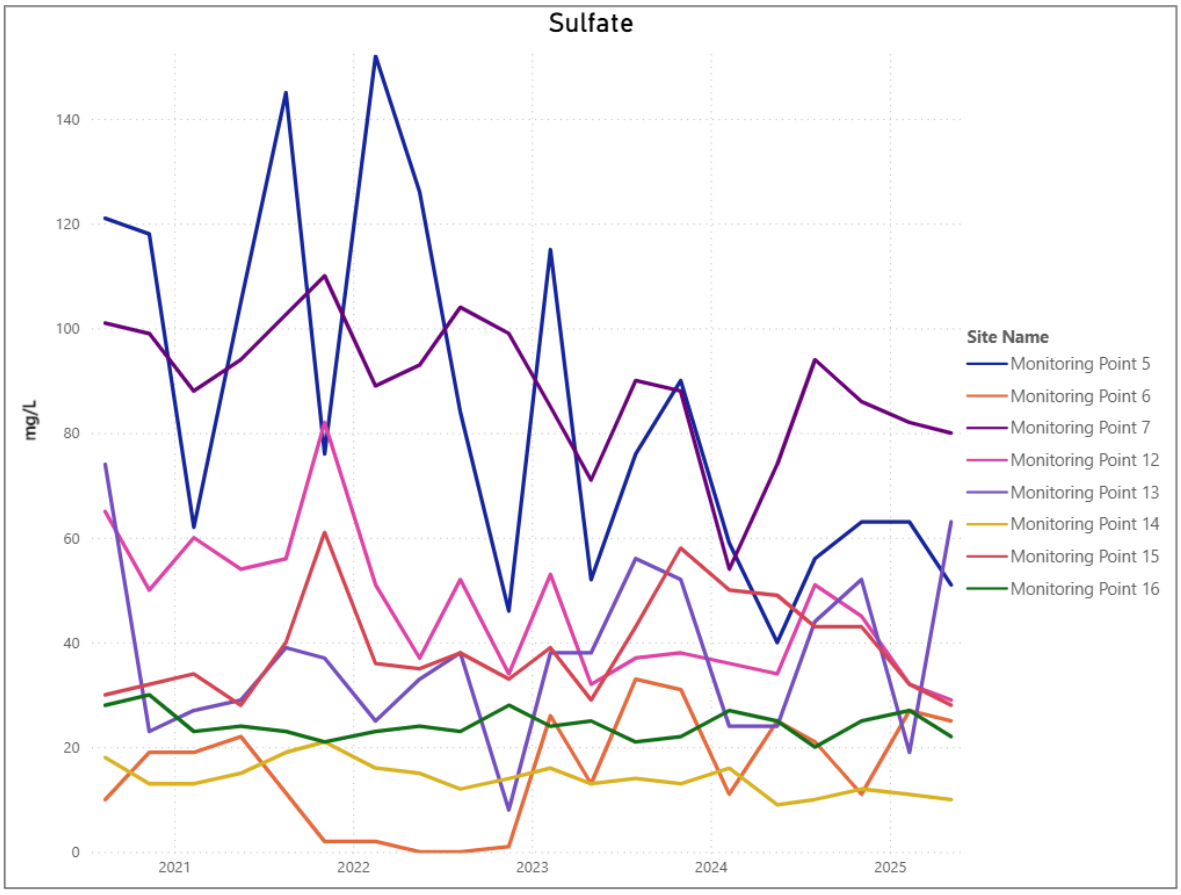


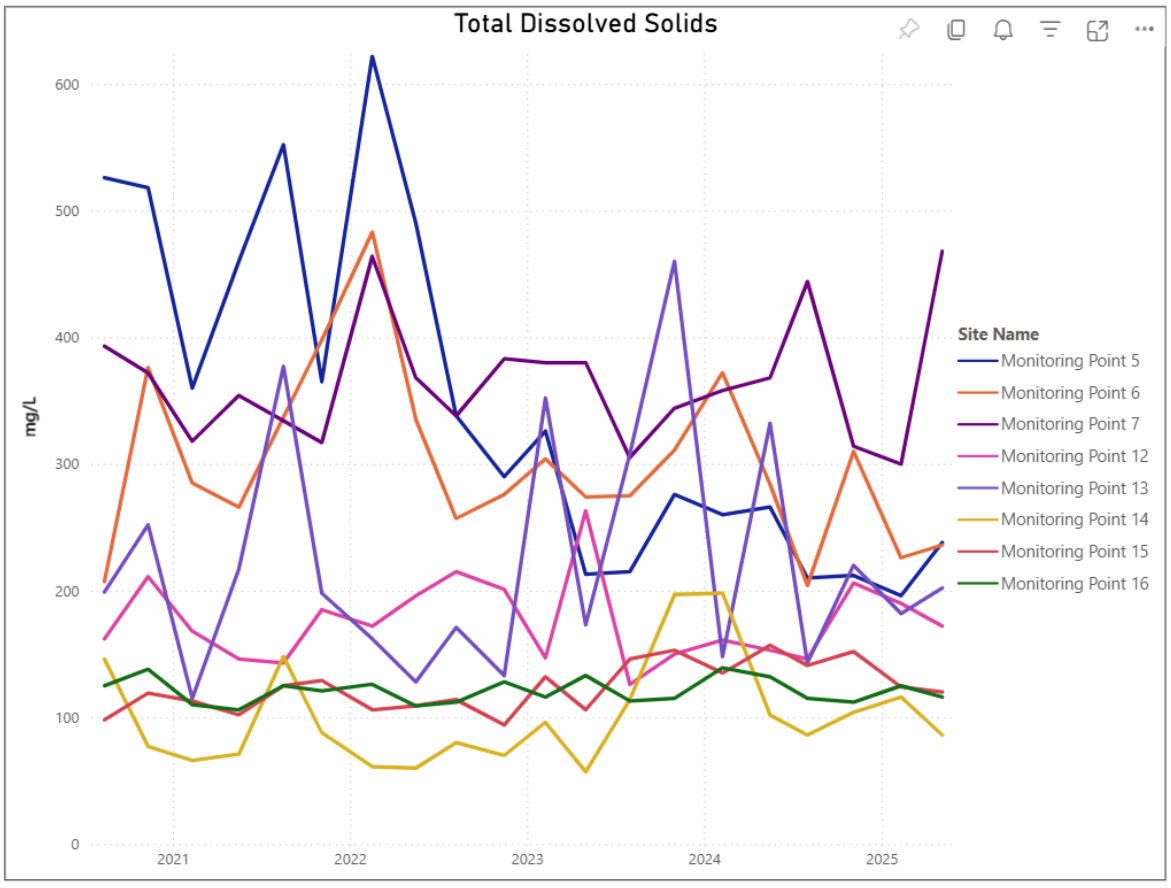


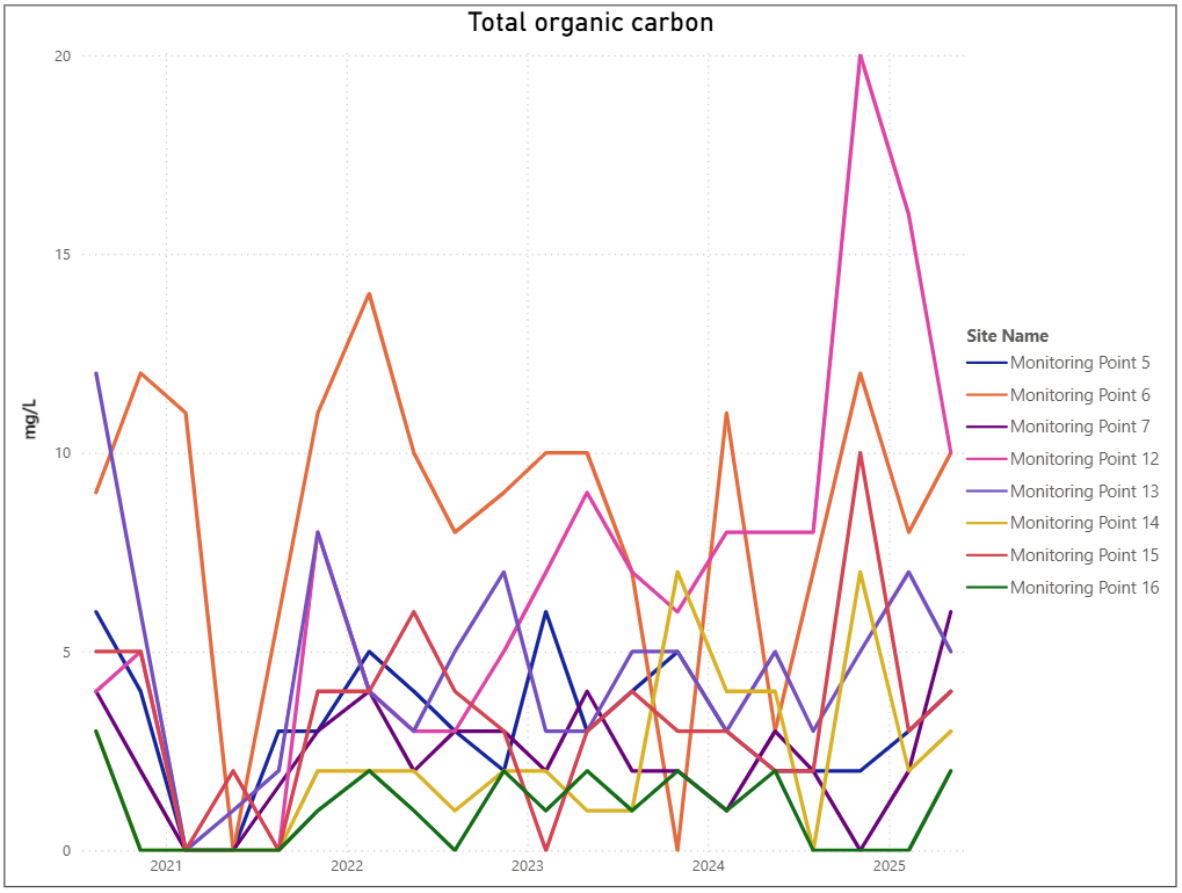


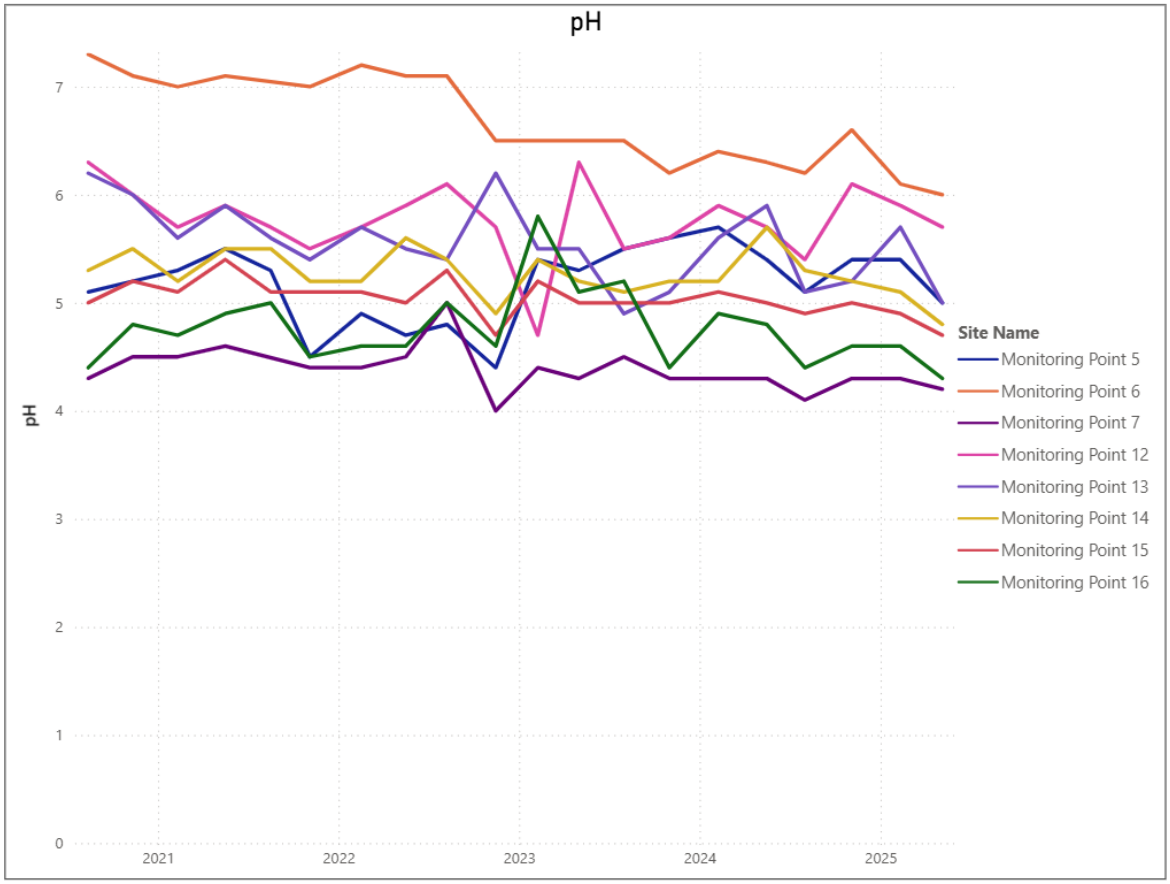




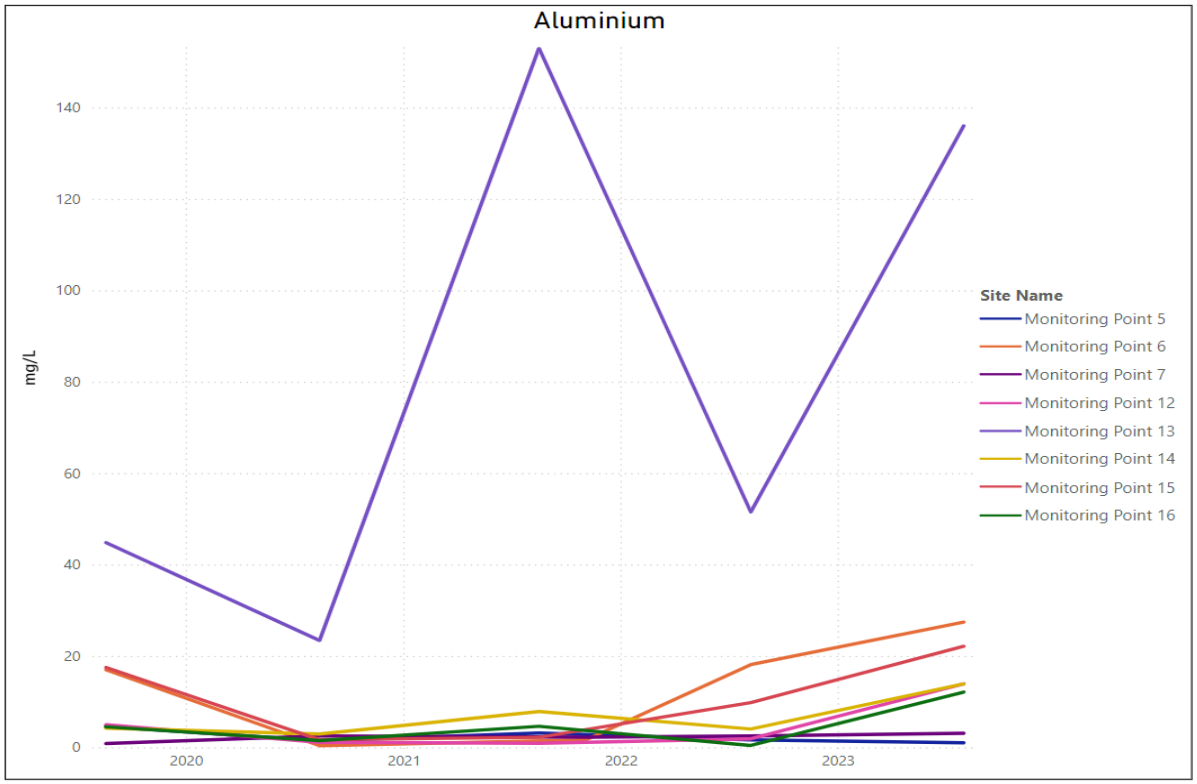


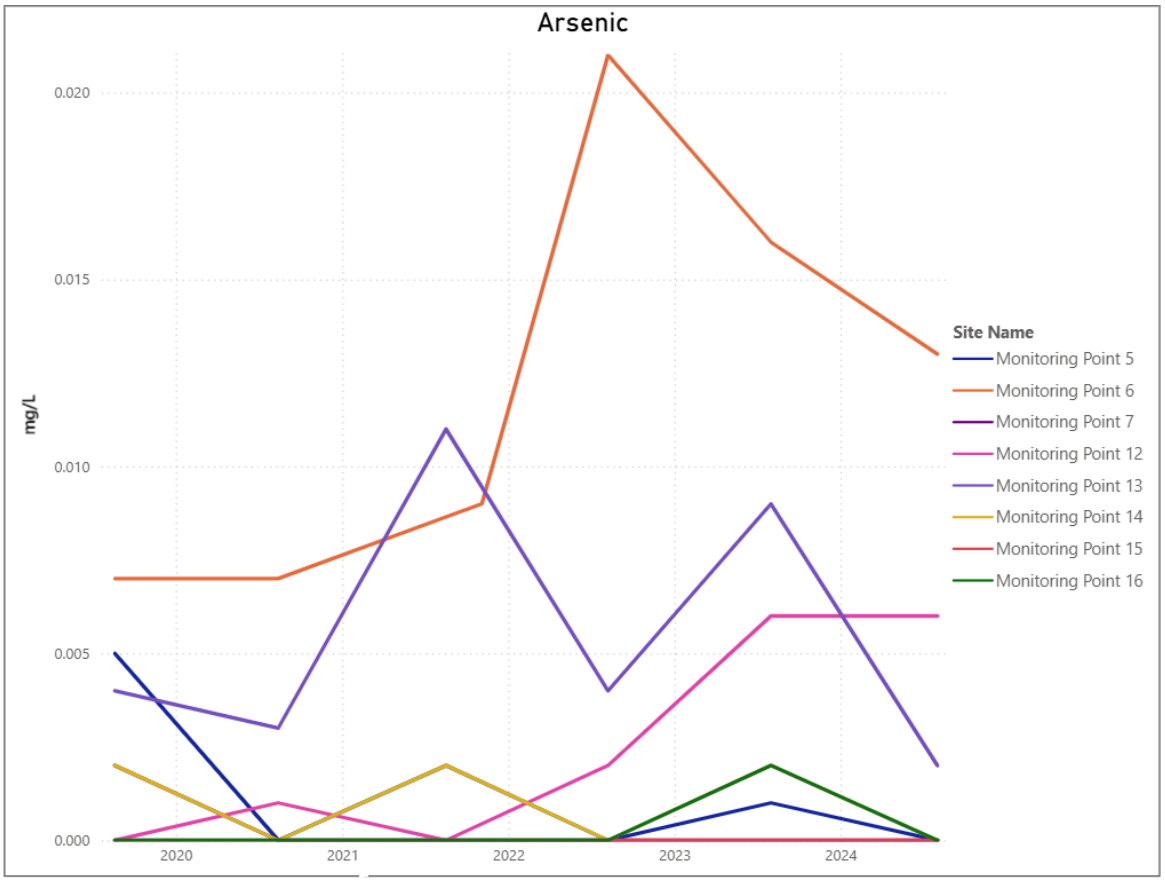


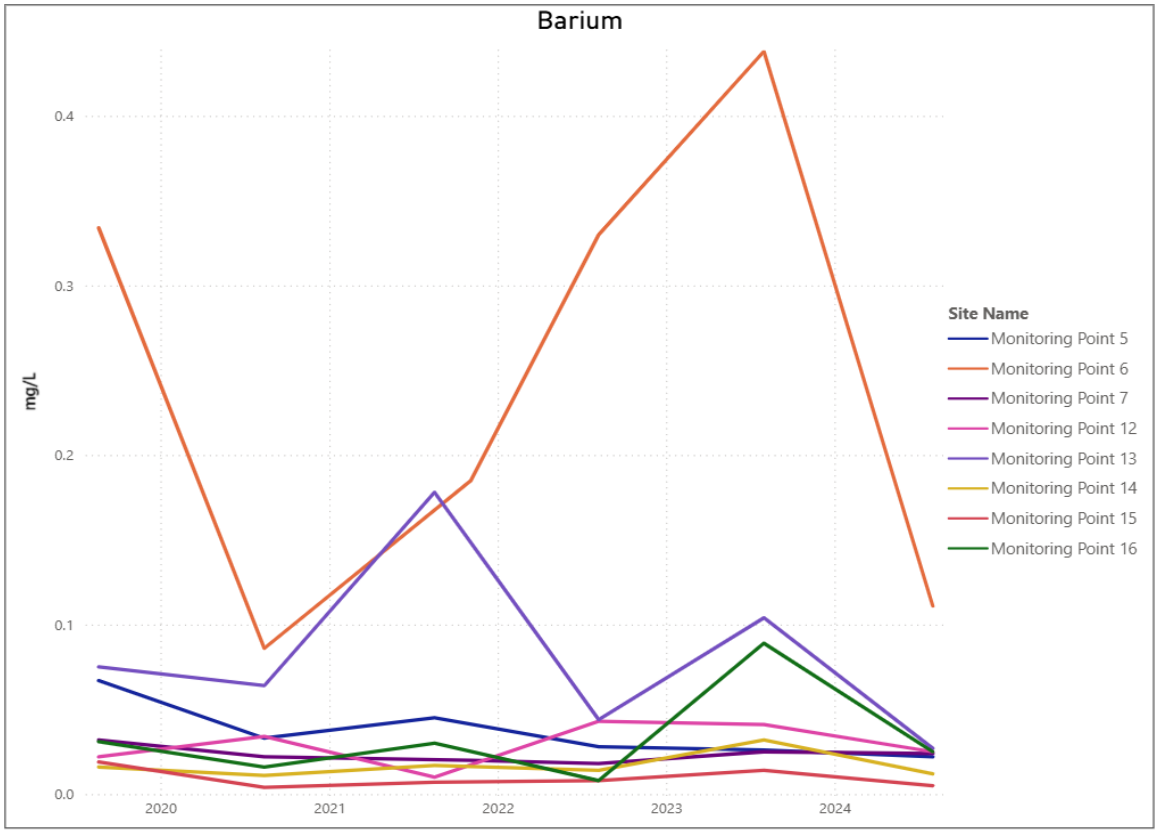


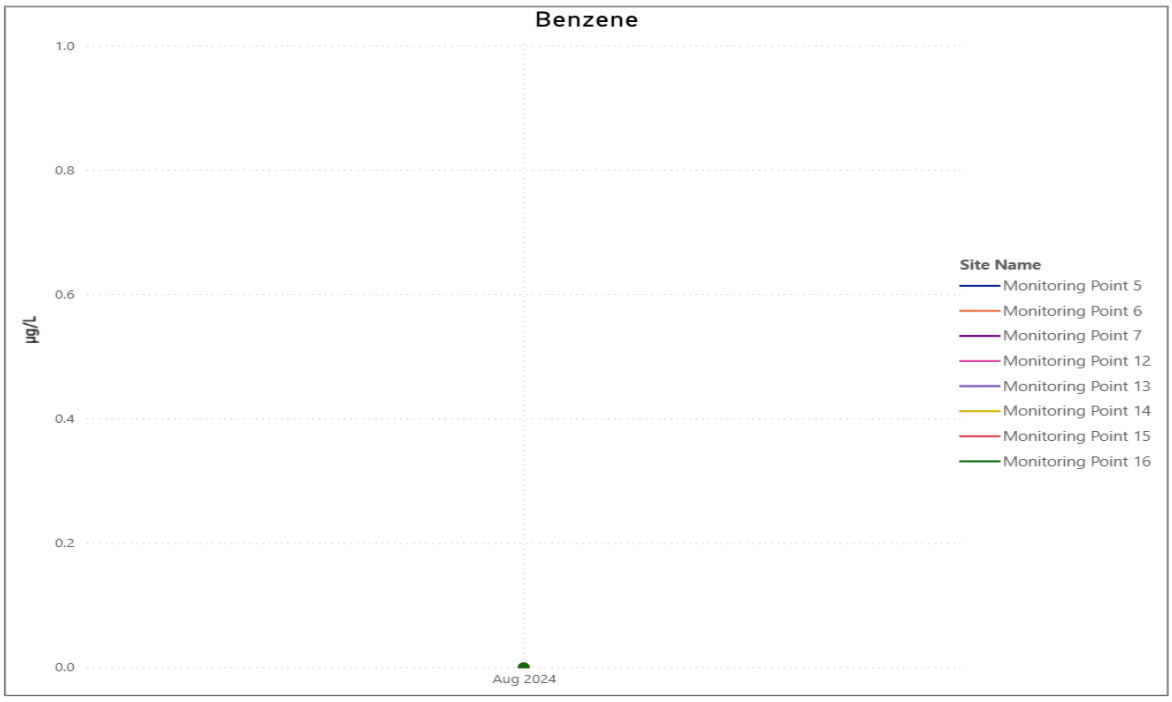


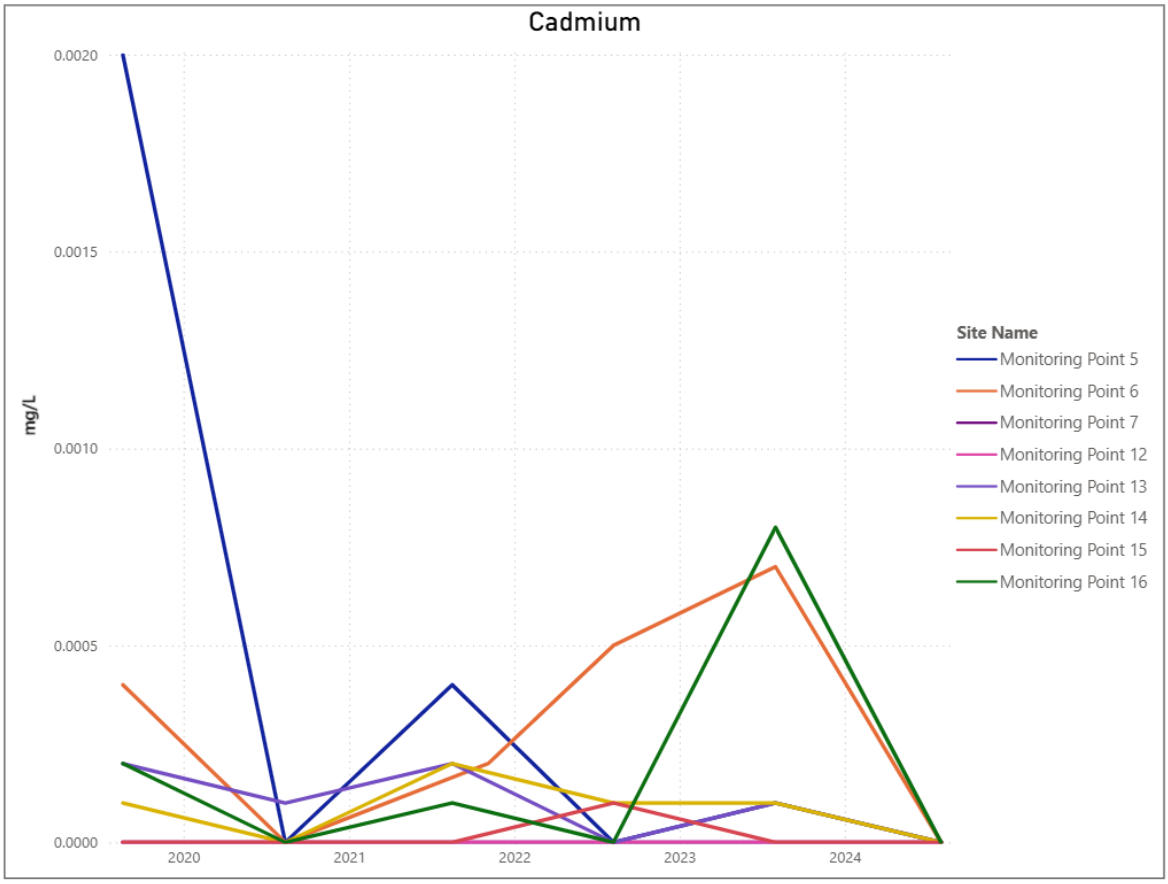
Helensburgh Annual Groundwater Results Including 2024/25 Reporting Period

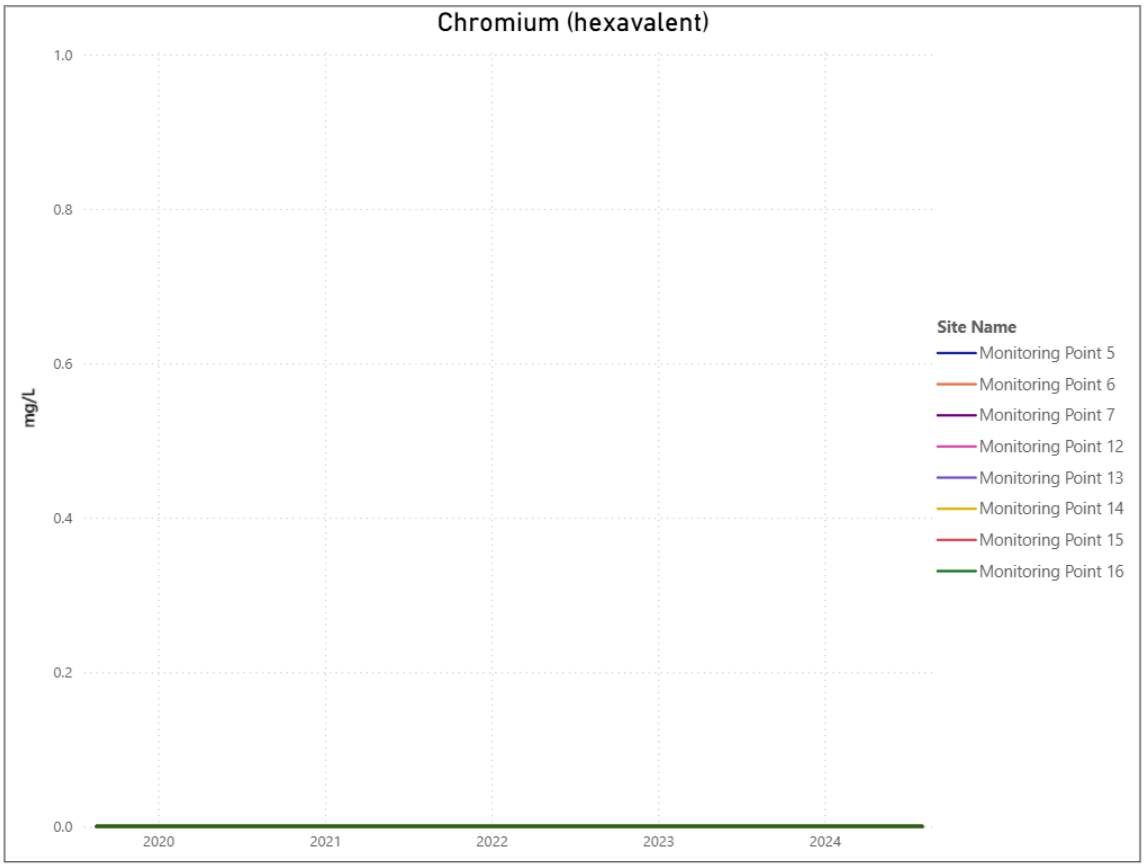


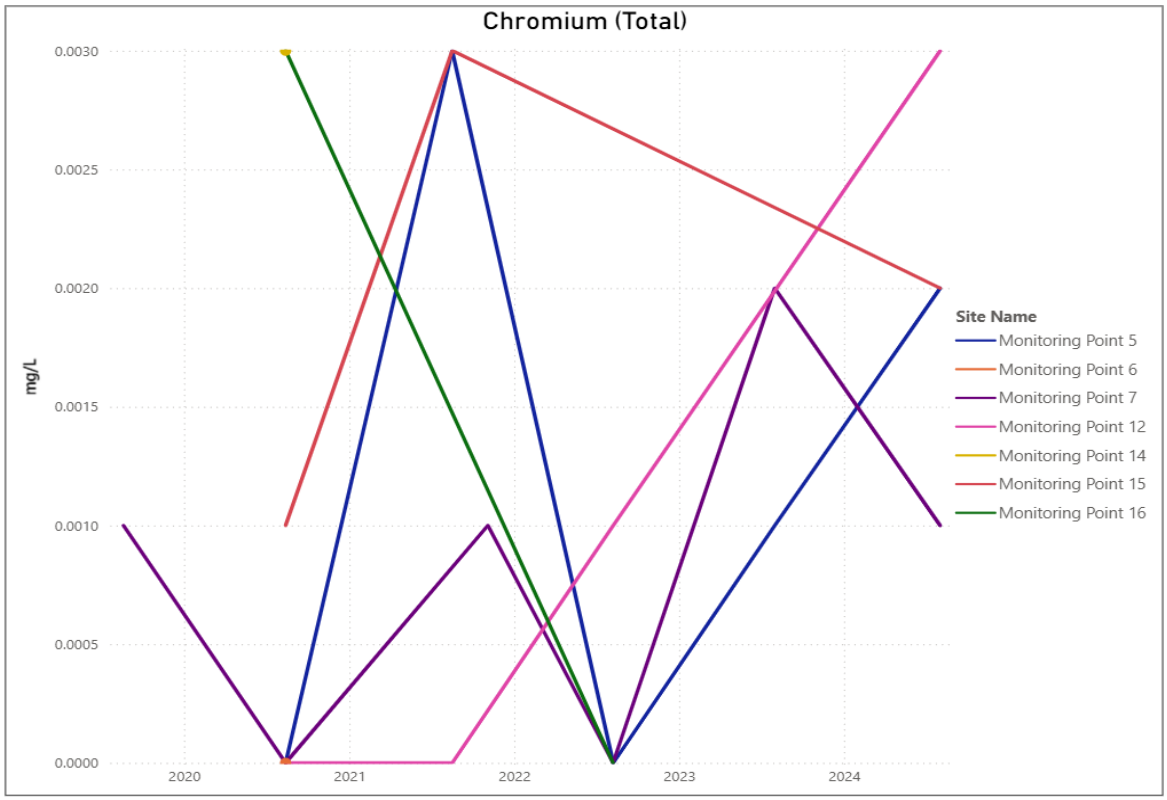


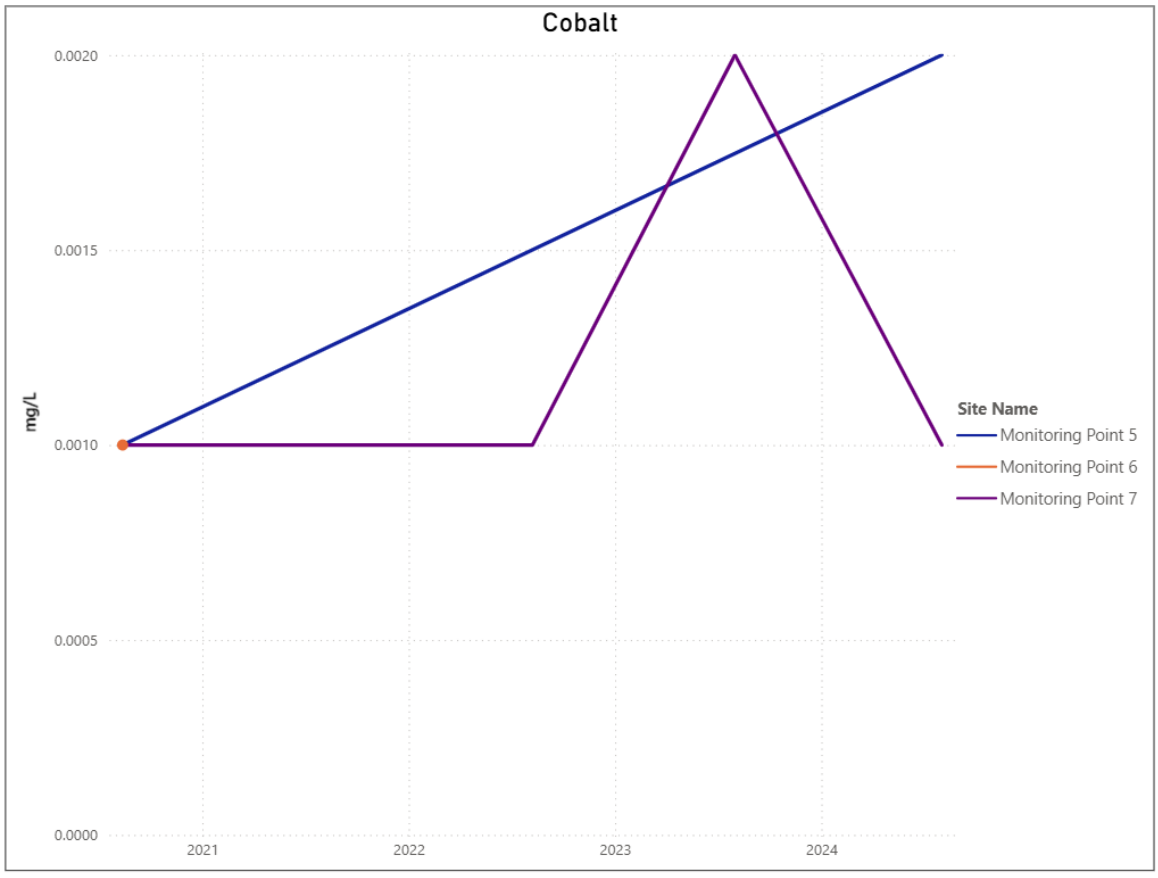


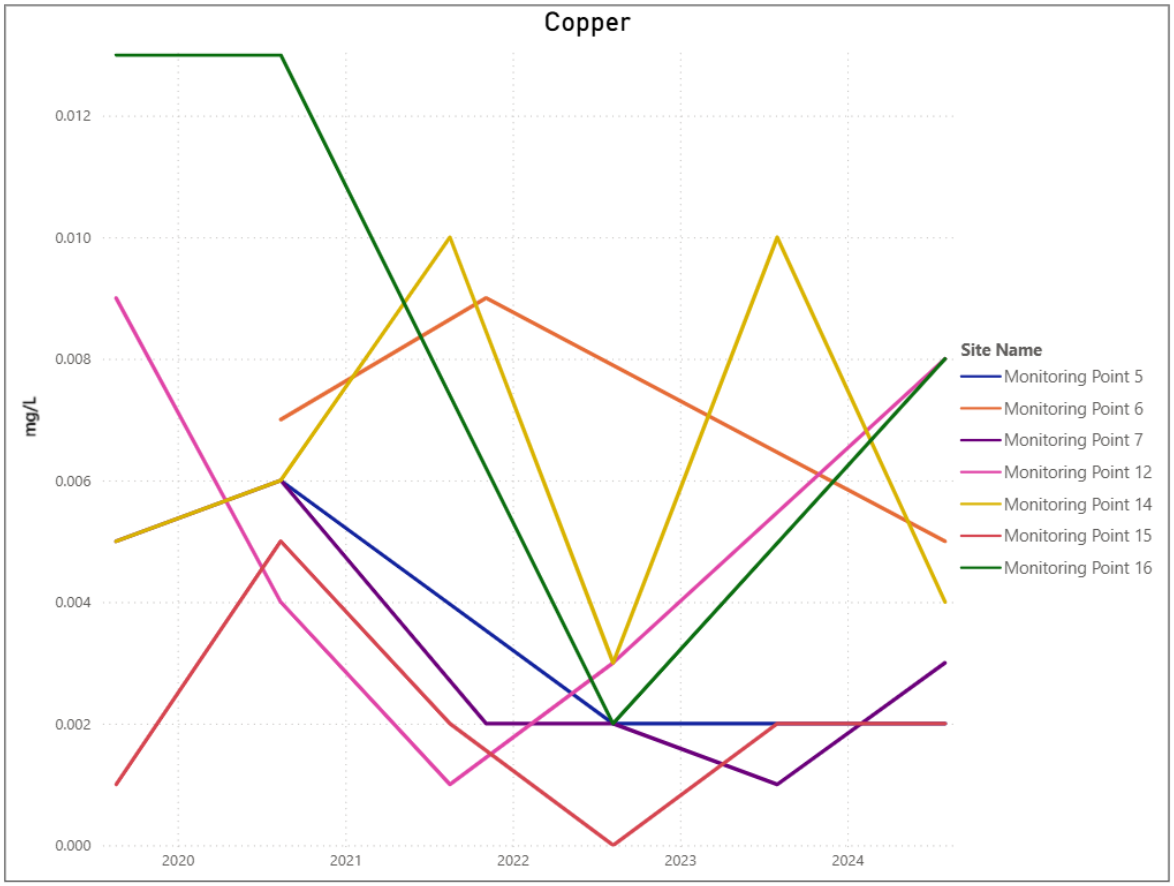


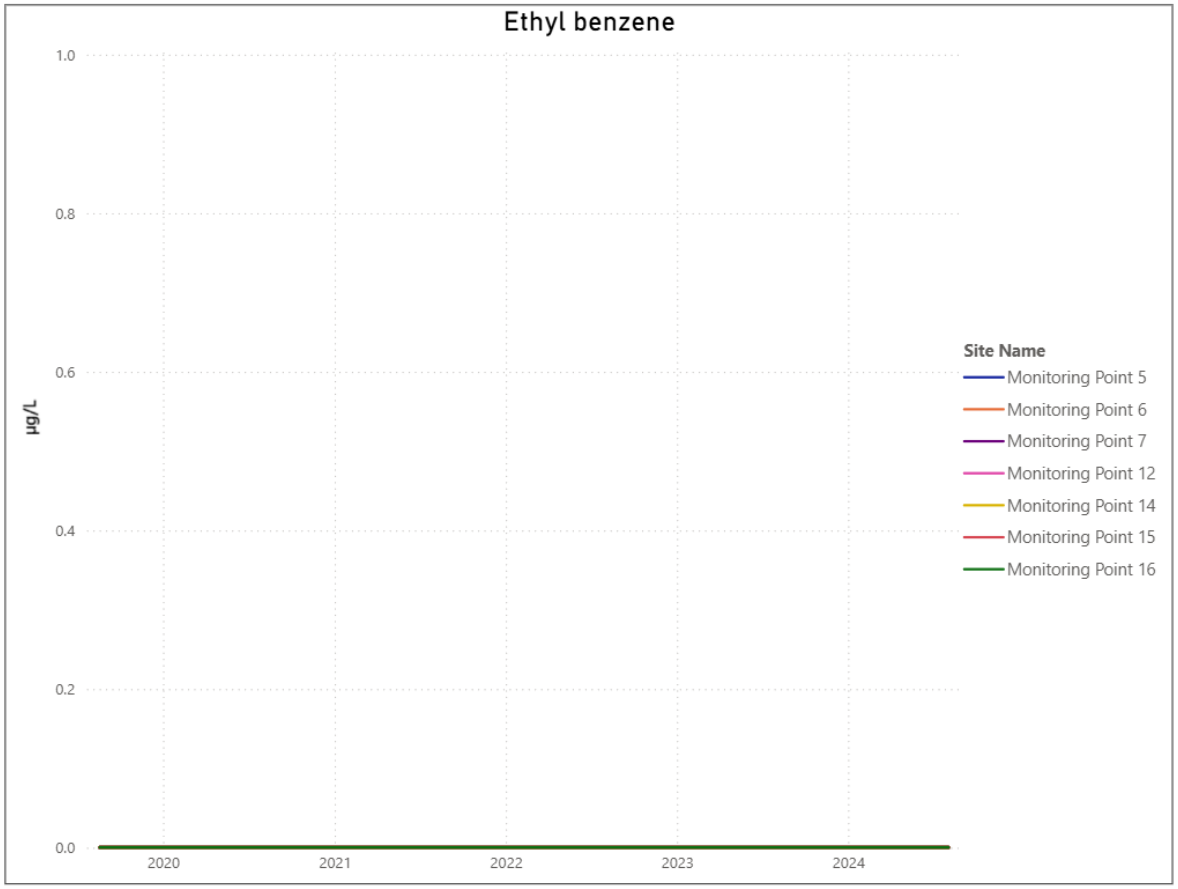


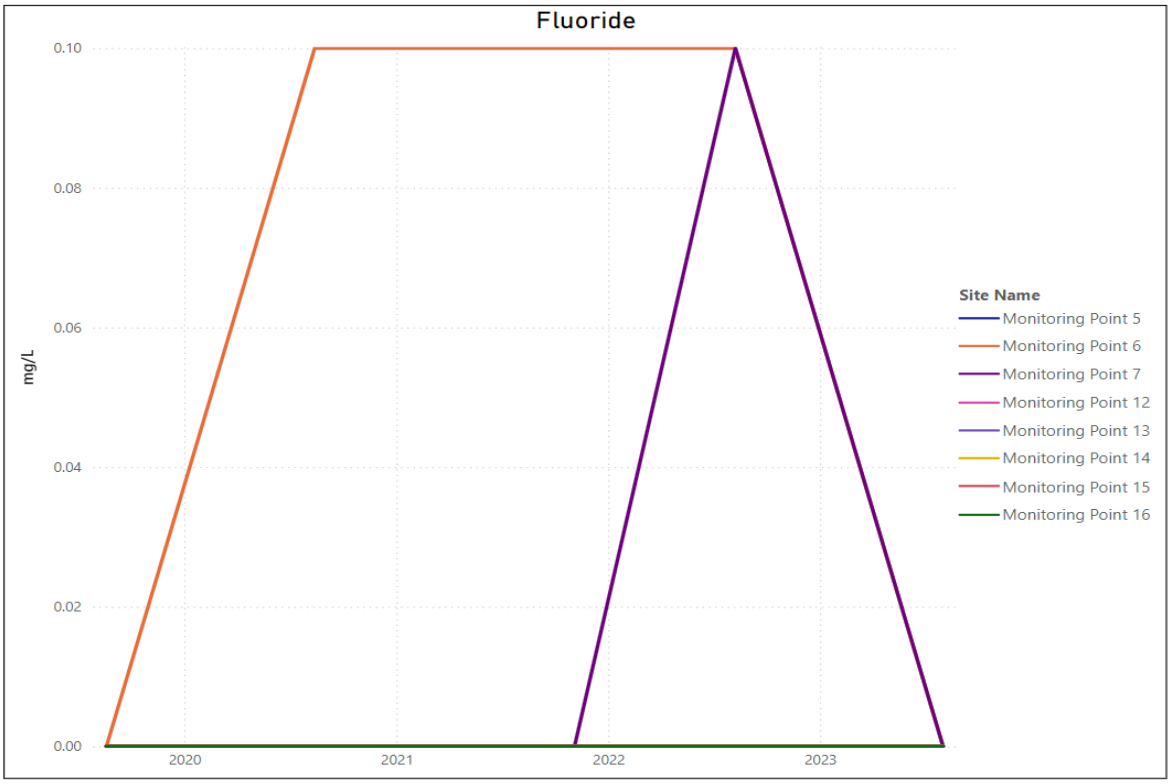


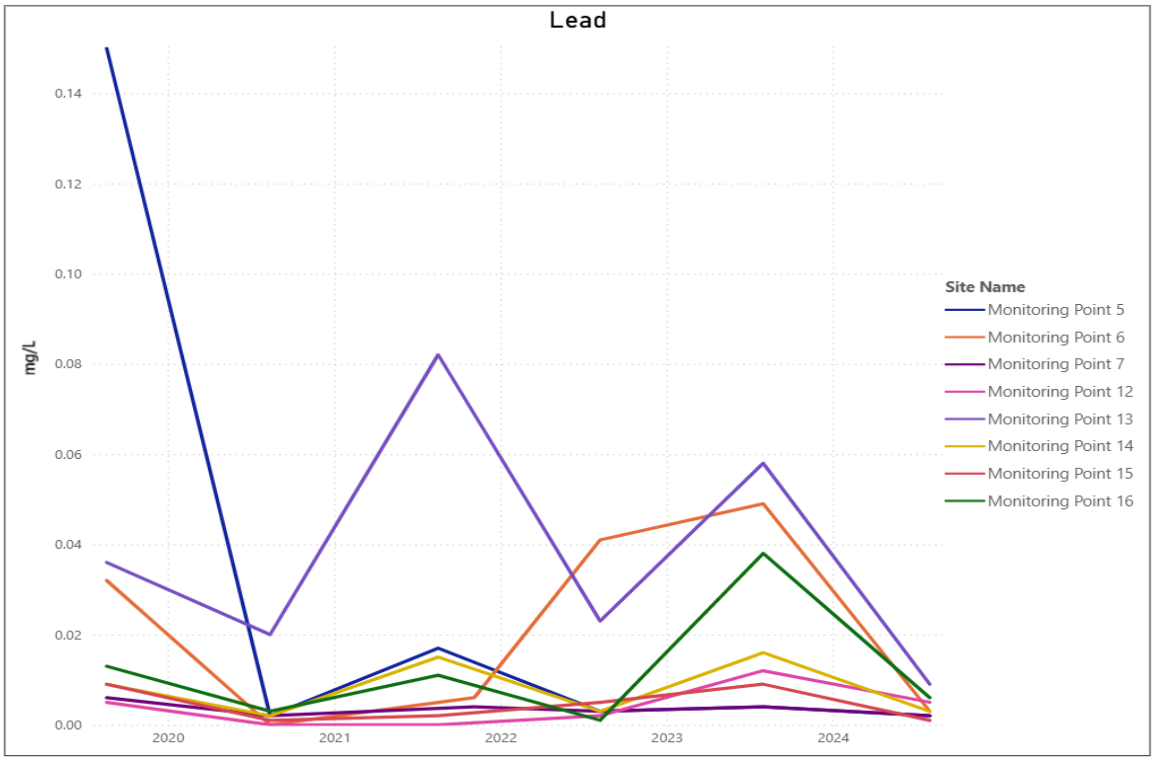


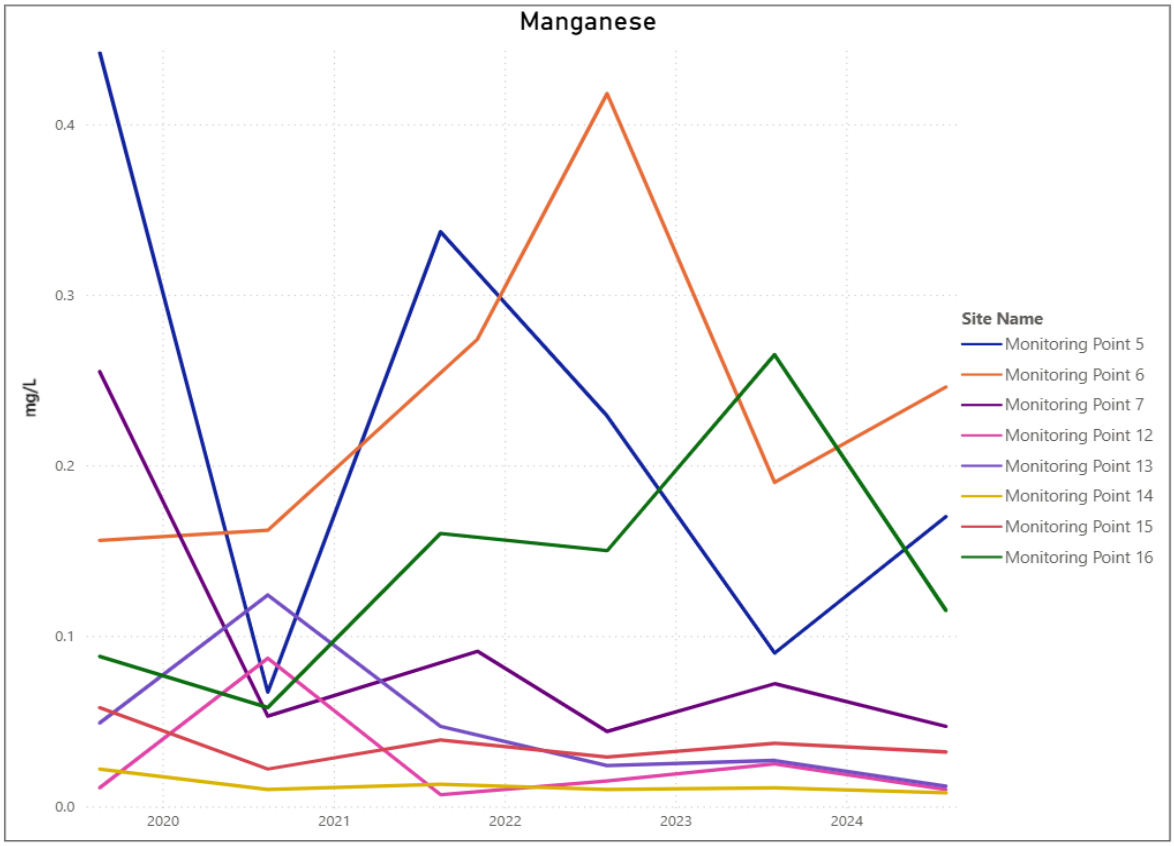


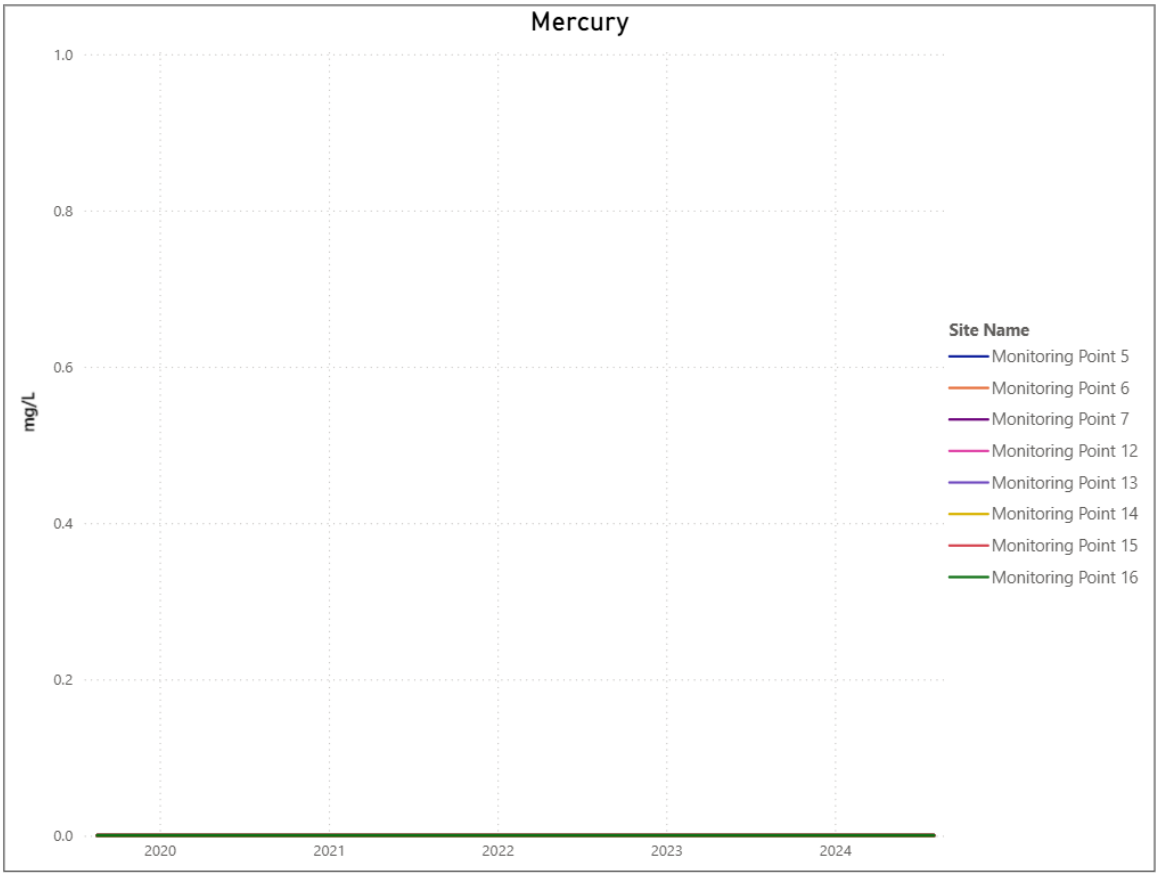


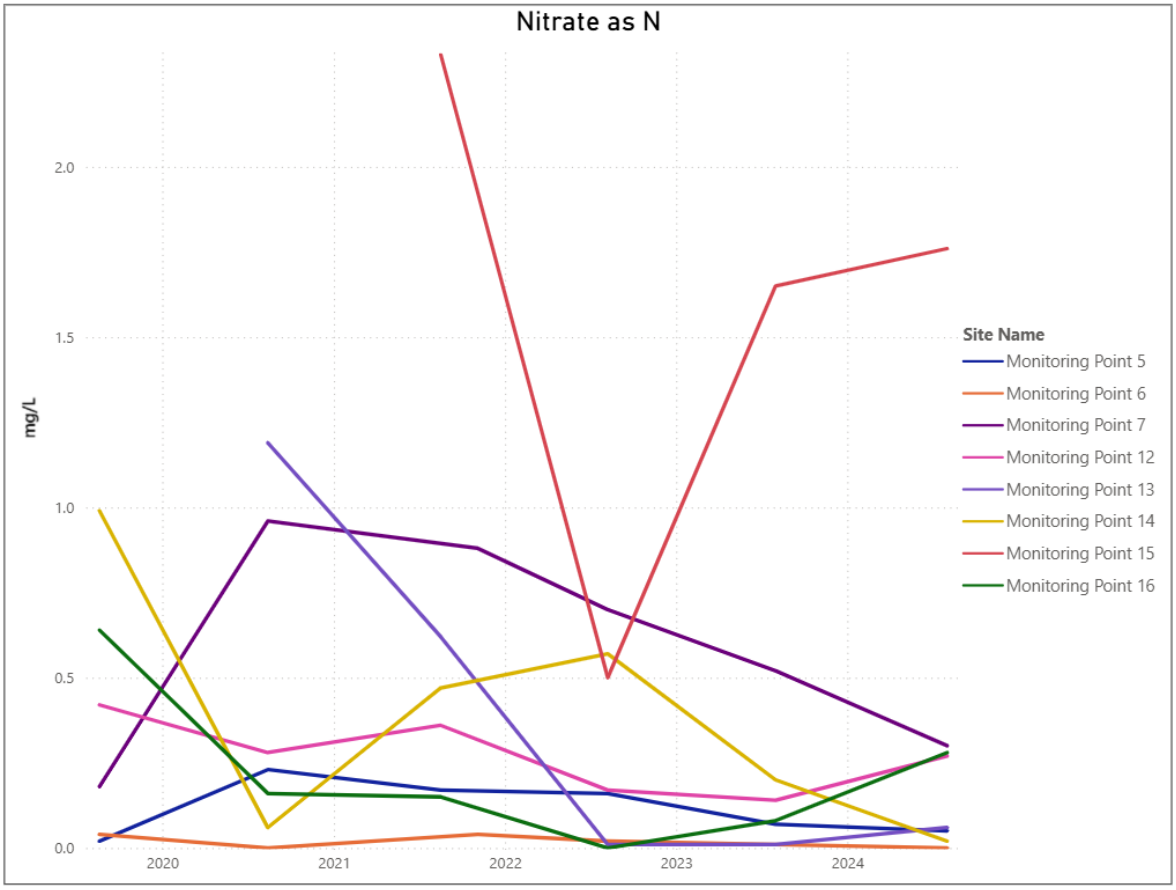


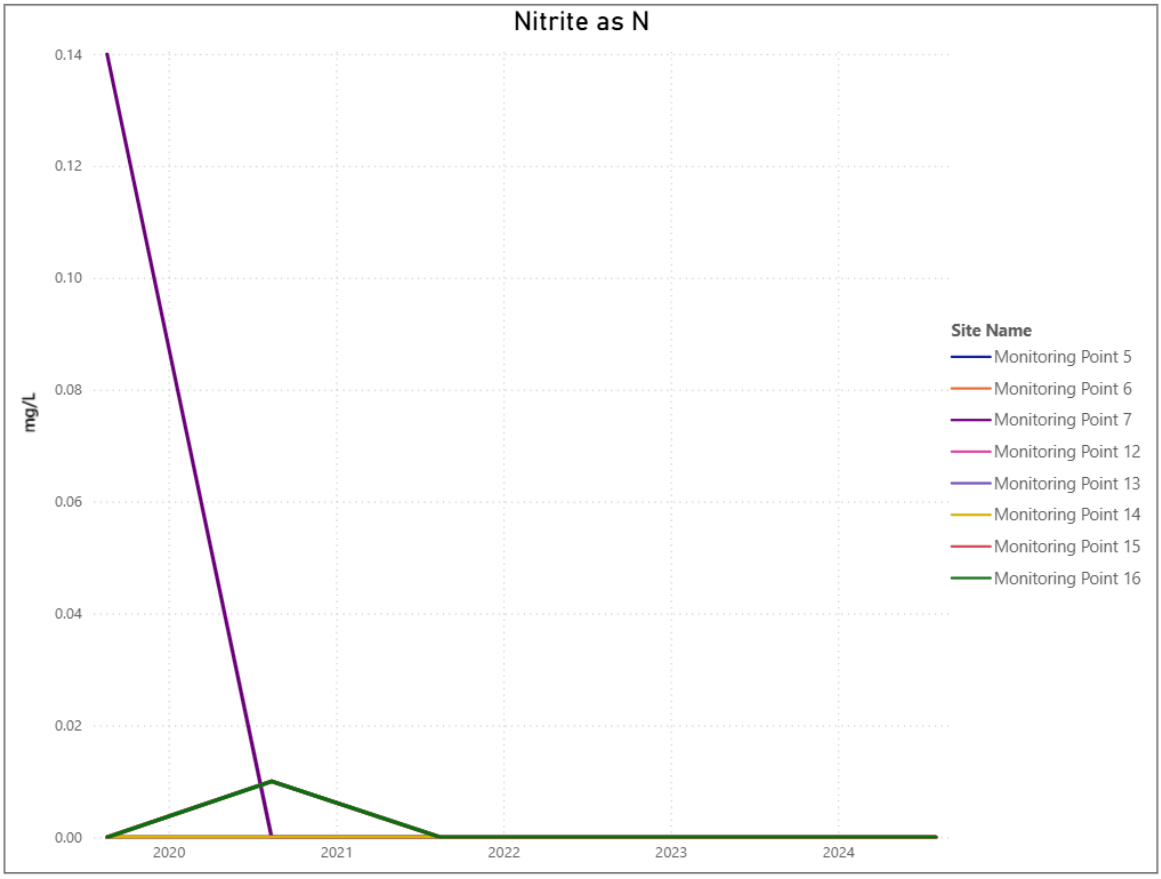


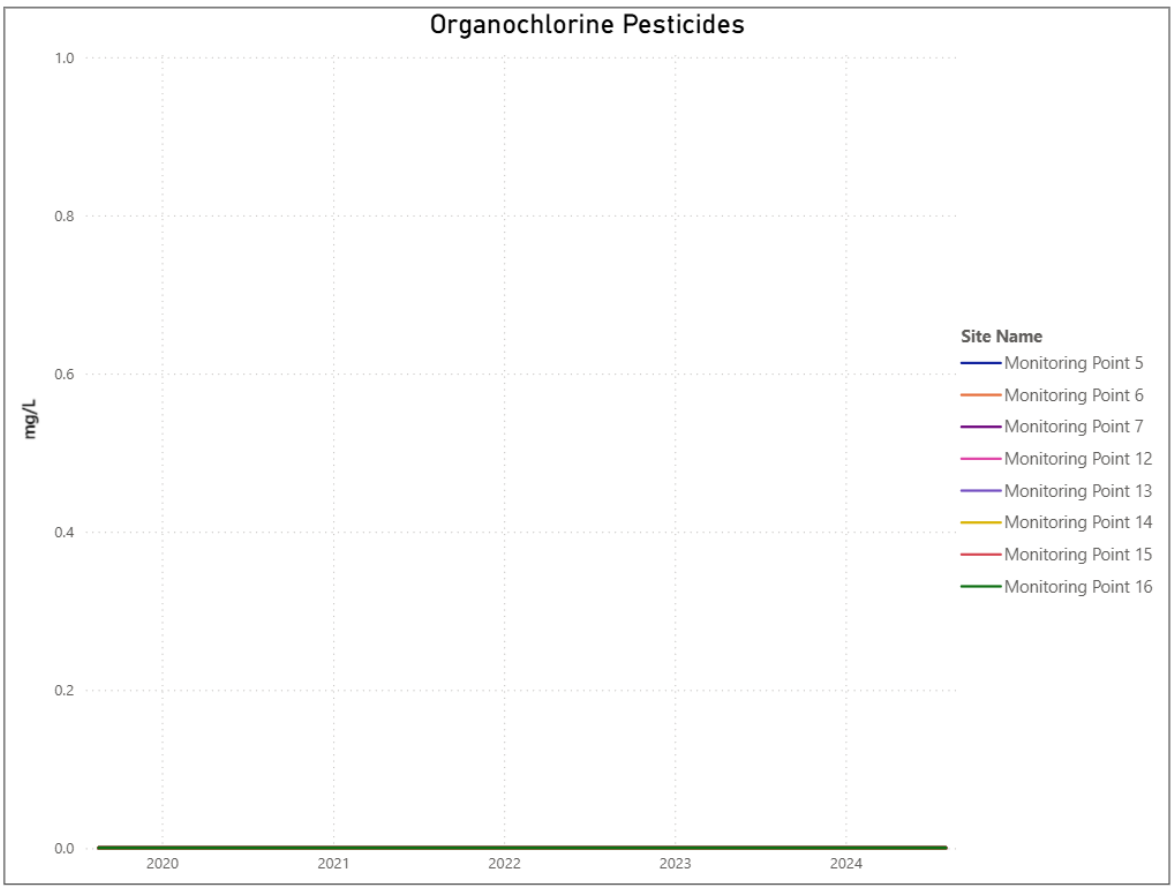


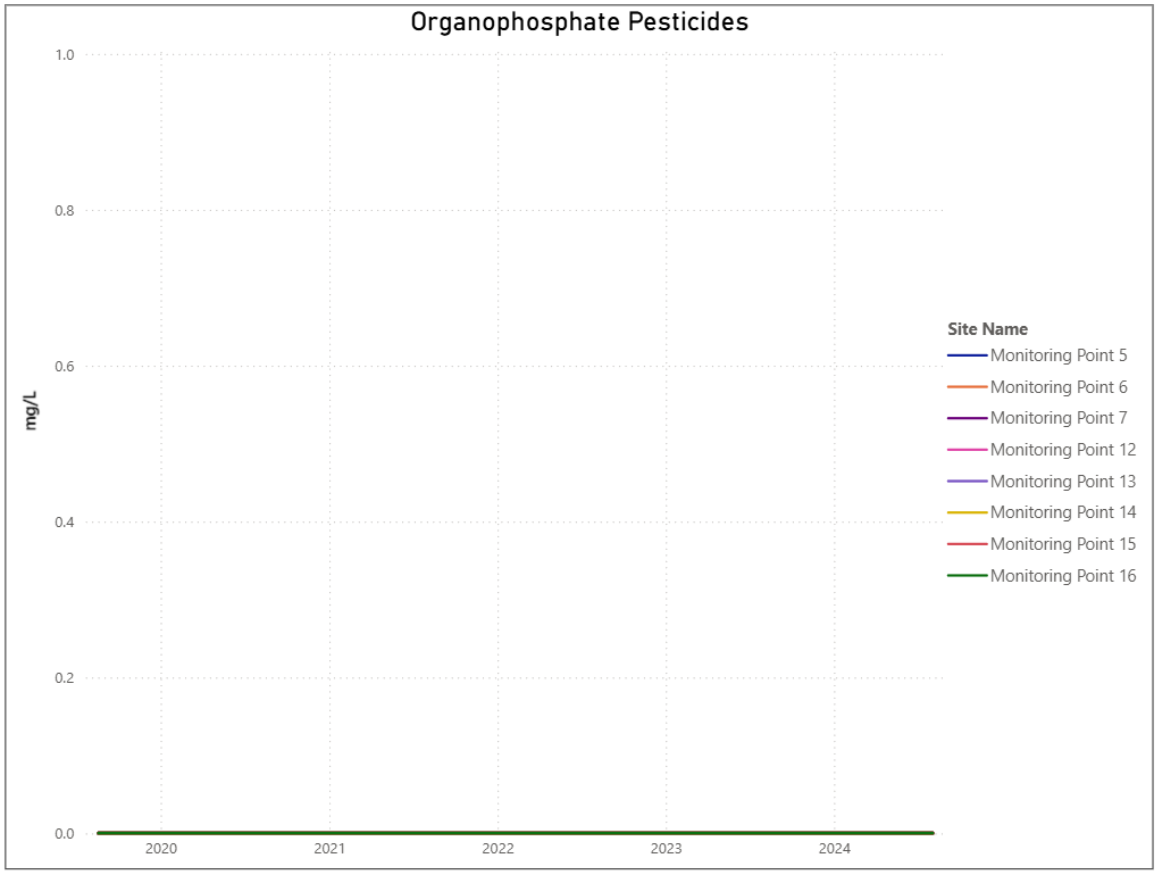


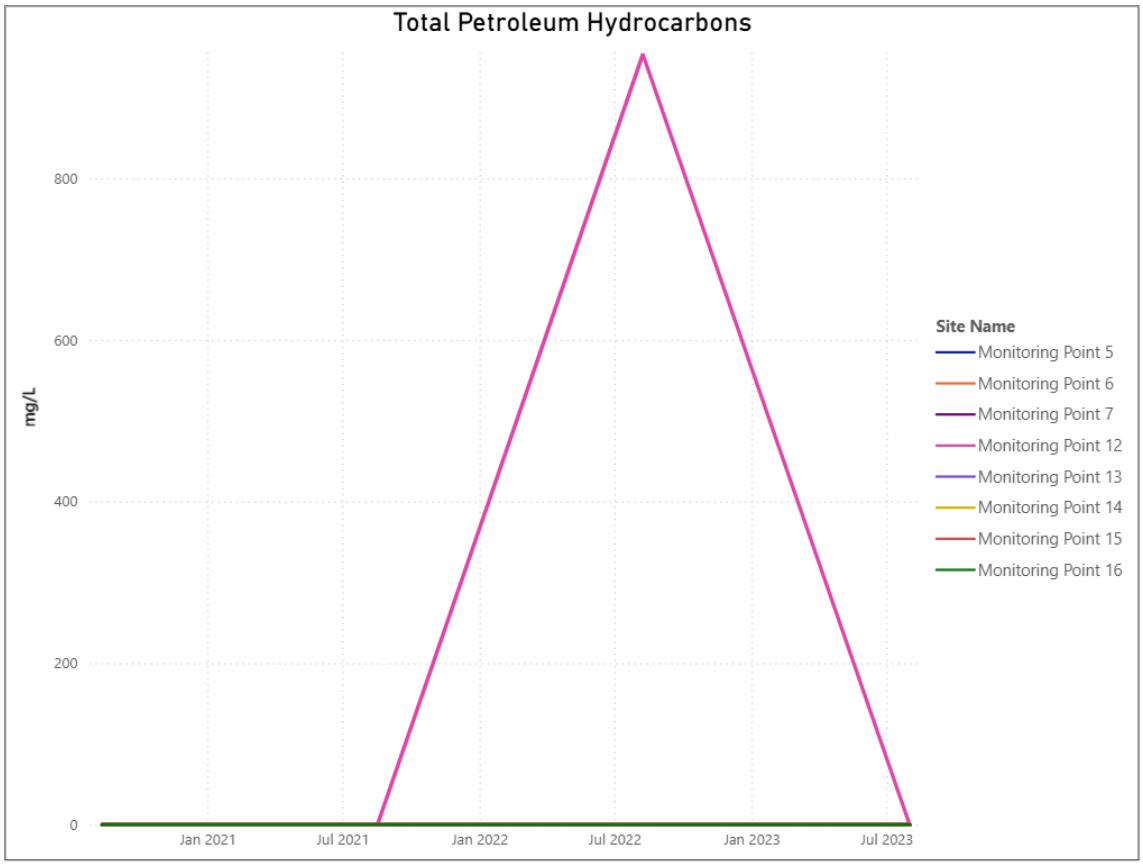


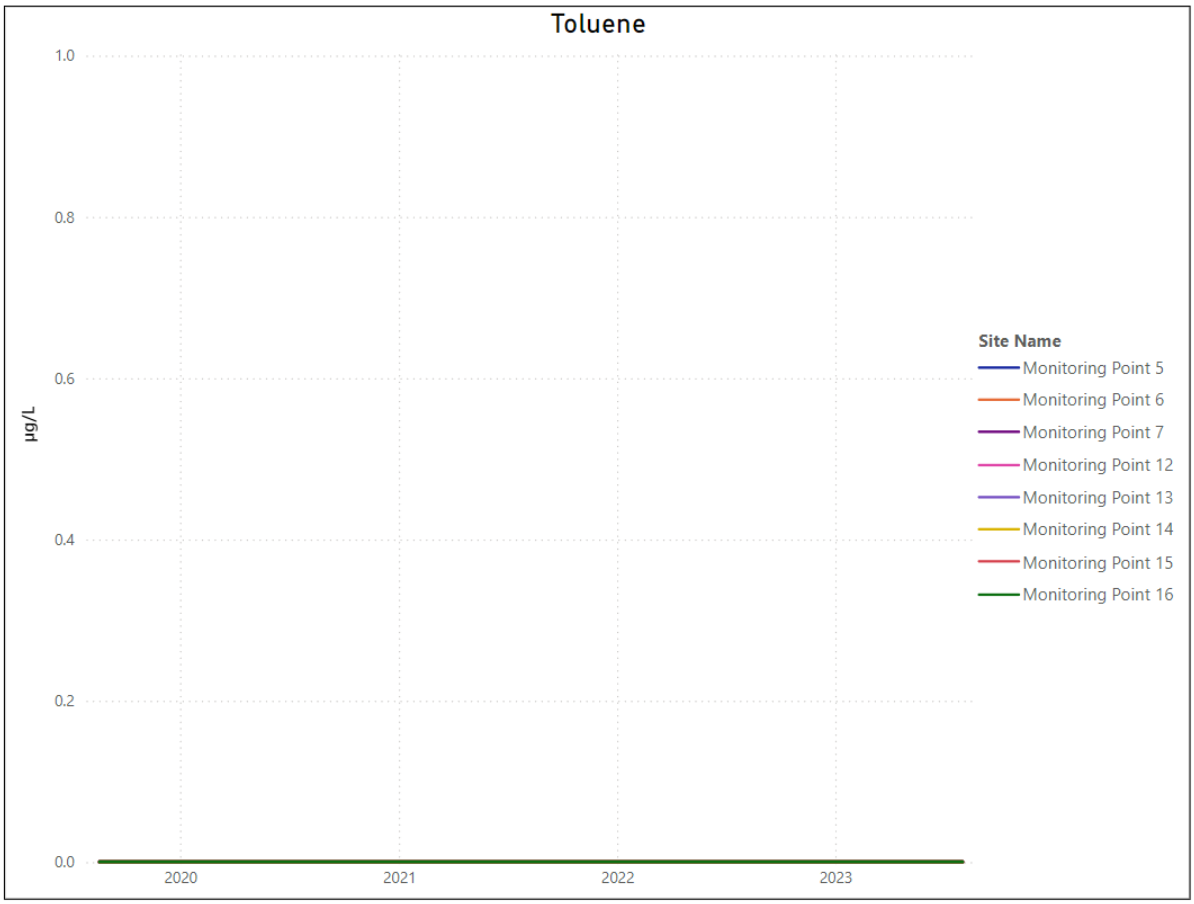


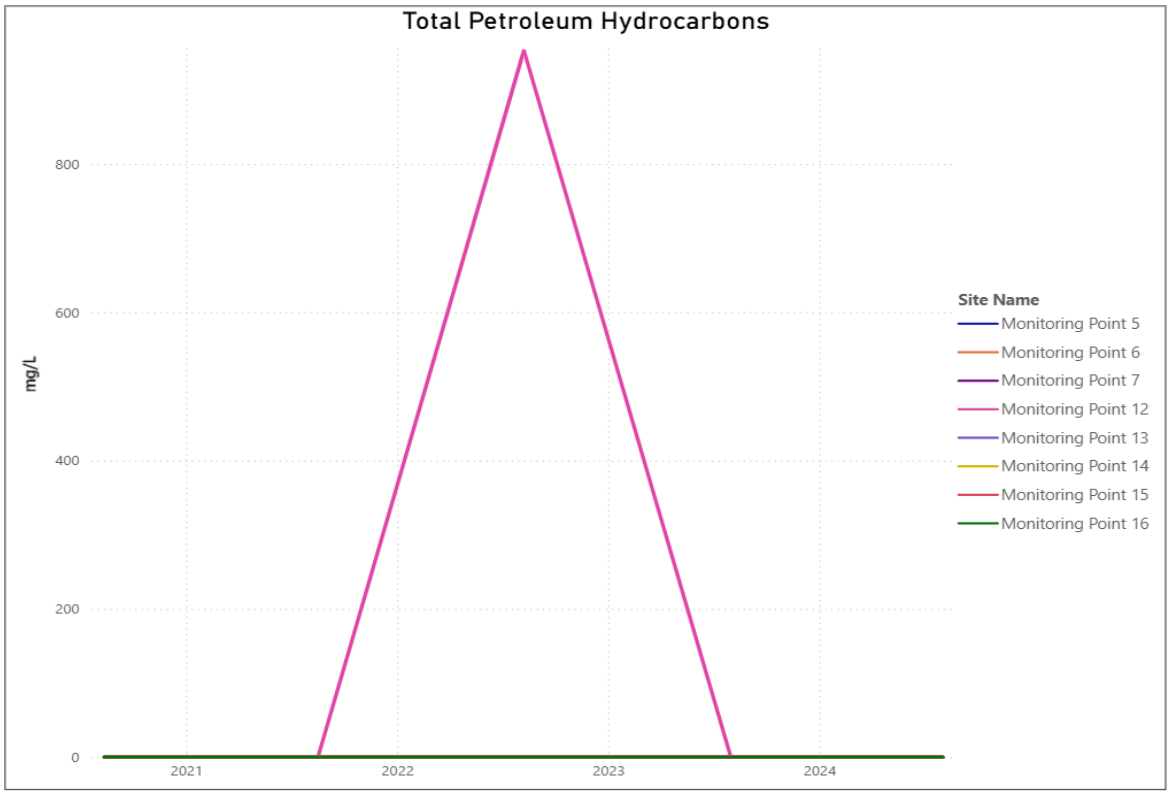


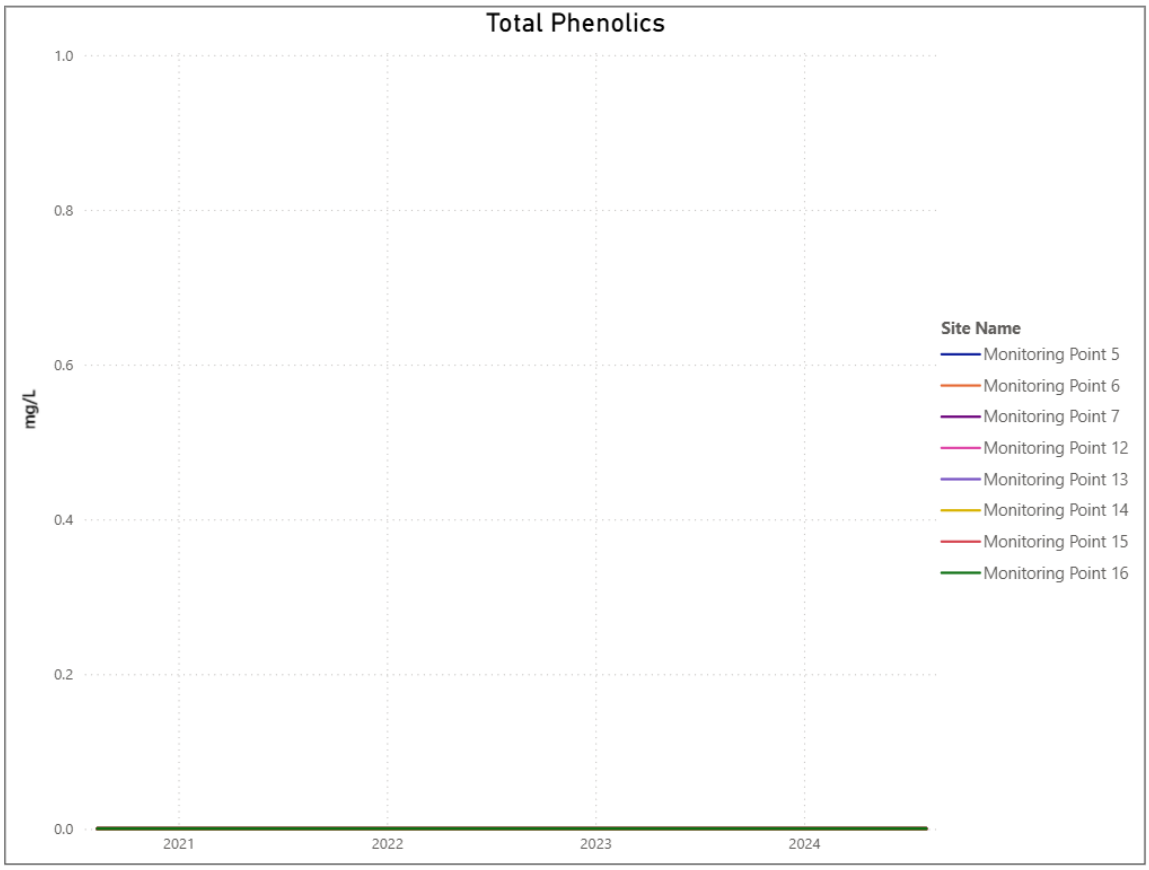


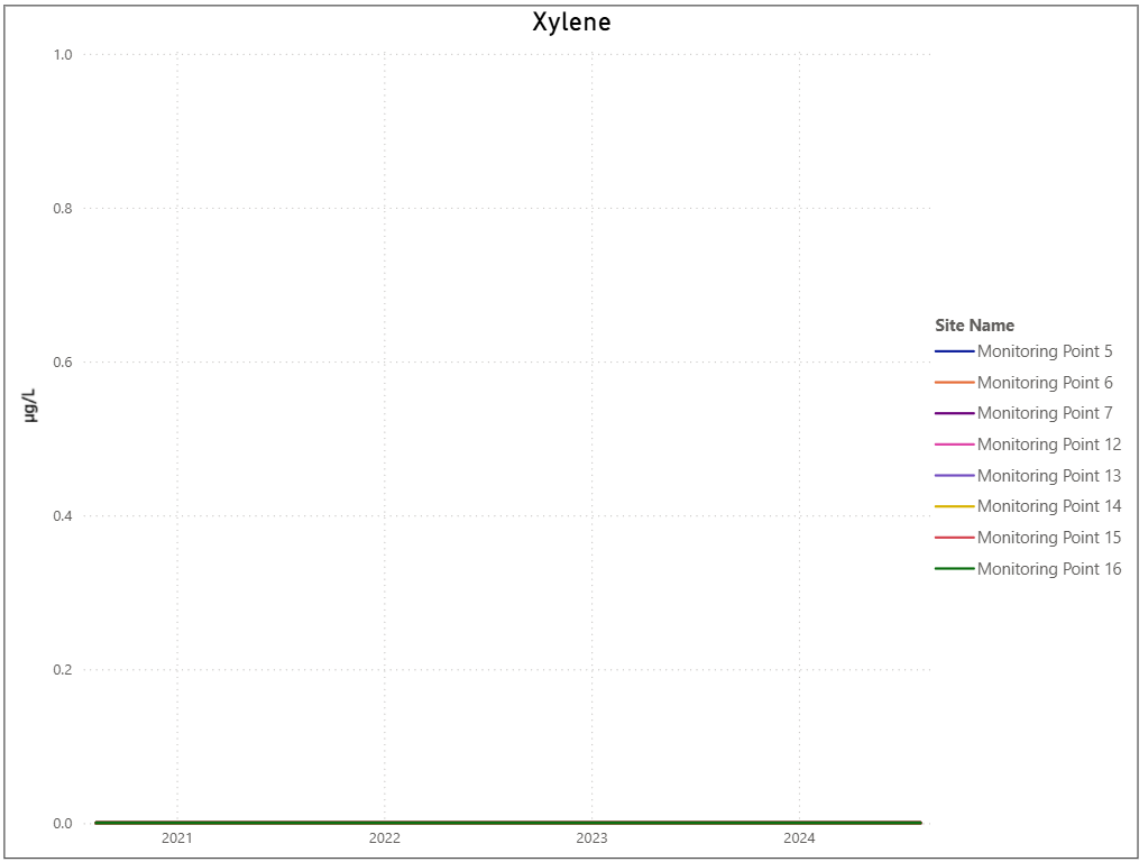


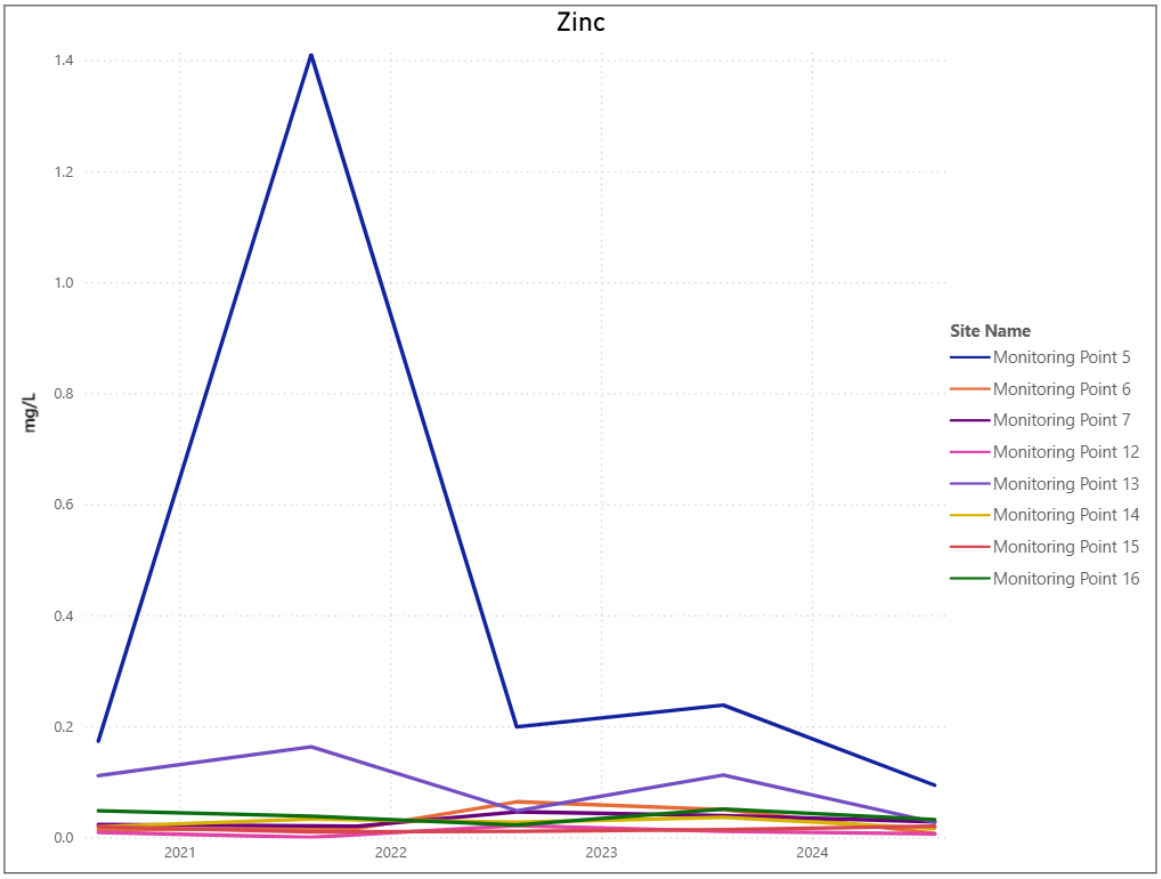












Helensburgh Quarterly Leachate Results including 2024/25 reporting period